APPENDIX 1

EXAMPLES OF INFORMATION DISTRIBUTED TO POTENTIAL STUDY PARTICIPANTS

LFR
LEVINE•FRICKE

August 31, 1998

Dear Station or Facility Manager:

LFR has been hired by the Santa Clara Valley Water District (Water District) to conduct a *Pilot Study of Underground Storage Tanks and MtBE Occurrence*. We are contacting you because your fuel station is one of about 150 stations in Santa Clara County that (a) has a UST system that meets the Federal and State 1998 UST Upgrade Requirements and (b) is not included on the SCVWD s Leaking Underground Storage Tank (LUST) list.

The Water District has allocated funds to investigate if MtBE is present in groundwater at sites like yours. The Water District s concerns were prompted by the detection of MtBE in a major water supply well in January 1998. As you also know, gasoline suppliers have used MtBE as a gasoline additive since the early 1980s to help reduce automobile emissions to air. The Water District has hired us to study the occurrence and magnitude of MTBE releases at upgraded UST facilities.

Your local Water District is participating with other agencies in California, such as the State Water Resources Control Board, in monitoring and investigating MtBE occurrence in surface water bodies (e.g., lakes) and groundwater. Due to increasing concerns regarding groundwater vulnerability, all fuel handling facilities operating throughout California may one day be required to investigate if their fuel supply facilities are a potential source of MtBE. Your participation in this study will provide you with the data to determine if your facilities are a potential source of MtBE at no direct cost.

Approximately 150 station are being considered for the study. Of those 150 sites, we will select approximately 30 sites for study based on specific factors. Key among those factors is the cooperation of the station managers and owners and compliance with 1998 upgrades.

Advantages of participating in this Pilot Study include:

- the opportunity, ***at no direct cost to you,*** to demonstrate to your local customers your concern for the quality of the drinking water in your community
- an opportunity, ***at no direct cost to you,*** to identify possible undetected releases before much more significant problems develop
- ***an opportunity to establish a working relationship with your local water district***

If you are interested in participating in the study, please put an "x" in this box ☐, fold this mailer so that the Levine·Fricke·Recon address appears on the outside, seal it with tape or a staple, and drop it in the mail. Because you are interested in participating in the study does not guarantee or bind LFR or the Water District to investigate your site. If your site is included in the study, our work at your site likely will be completed within approximately five ***non-consecutive*** days. We would work with you to minimize potential disruption to your operations.

Thank you for taking the time to consider participating in this study of vital water supplies in Santa Clara County. If we can answer any questions, please call Levine·Fricke·Recon at (510) 652-4500 and ask for Kathleen Isaacson, R.G., C.HG., Principal Hydrogeologist, Andy Lojo, R.G., Senior Geologist, or Jenifer Beatty, R.G. C.HG., Senior Hydrogeologist.

1900 Powell Street, 12th Floor, Emeryville, California 94608-827 (510) 652-4500 fax (510) 652-2246
Office Worldwide

SANTA CLARA VALLEY WATER DISTRICT

Pilot Study of Operating Underground Storage Tanks

FREQUENTLY ASKED QUESTIONS

What is the Study objective?

The primary objective of the Pilot Study is to investigate if MtBE is present in groundwater at sites with upgraded underground storage tank (UST) systems and where no previous release of MtBE has been reported. An upgraded UST system meets the 1998 federal and state-mandated UST upgrade requirements or the new UST construction requirements (1995 or later). The Santa Clara Valley Water District (the District) will use the results of the Study, and possibly information obtained during subsequent investigations, to evaluate whether upgraded UST systems are protective of groundwater quality, and ultimately drinking water. This Study and other District groundwater vulnerability assessments are critical in formulating a plan to protect drinking water supplies into the future.

What will on-site work consist of?

- A site inspection to evaluate access issues (i.e., space limitations), establish work areas and schedules with the facility operator, confirm UST system components, and identify utility/piping locations.
- Cone penetrometer testing (CPT testing) at about 3 to 4 on-site locations, to obtain site-specific information about the depth to groundwater and types of soils at the site.
- A soil-gas survey at 8 to 16 on-site locations.
- Soil and groundwater sampling at about 6 locations.

E A LE S EDULE

SUN	MON	TUES	WED	THURS	FRI	SAT
	Site Inspection *4 hrs*					
	CPT Testing *4 hrs*					
				Soil-Gas Sampling *8-12 hrs*		
		Soil & Groundwater Sampling *16 hours*				

Work will be scheduled with the individual station managers and is anticipated to be conducted on nonconsecutive days over a 4-week period.

What about business disruptions?

We will establish a work schedule in accordance with each station operator s requests. Each of the phases of on-site work is short (2 days or less) and we will make every attempt to remain flexible while on site to accommodate the station operator s needs. We will explain the type of work we will be conducting, the size of equipment we will be using, and show each station manager or owner the approximate locations where we will need access. We will identify ways to minimize business disruptions: What are the busiest days and times of day so that we can avoid them? Where are nearby locations to park our equipment to minimize our presence on site? We will also work at night if necessary. Finally, when on-site work is complete, no equipment or subsurface structures will be left on site. And we will restore the site to pre-investigation condition to the extent feasible.

How will we make sure we don t damage your product lines or utilities?

Before beginning on-site work, a UST system expert will inspect the work site to mark subsurface piping locations. Also, a private utility locating service will locate and map subsurface utilities. If available, we will also use as-built diagrams that show the UST system layout and the approximate locations of the UST system components. As required by law, Levine·Fricke·Recon will notify Underground Service Alert at least 48 hours before conducting any intrusive activities.

In addition, we will locate all borings a minimum distance of 3 feet away from any suspected underground piping or utilities. At sampling locations in areas where the utility survey could not confirm the presence or absence of utilities (e.g., due to interference), we will hand augur to at least 5 feet below grade to confirm that the location is clear of piping or utilities.

How will it affect the Study if I don t give you access to my site?

At selected sites where access is not granted, we will conduct investigation activities in off-site areas adjacent to a property to evaluate the occurrence of MtBE in groundwater. Such off-site investigations are much less desirable and may provide results that may be uncertain with regard to the origins of any contamination identified. These investigations might result in the involvement of multiple parties that could lead to potential damage claims from adjacent property owners. Further, if contamination is detected during off-site investigations, on-site characterization of the potential contaminants and sources will still be the responsibility of the owner/operator if only to demonstrate that the site is *not* the source of the off-site contamination.

If a release is suspected, will the final report draw conclusions about the source of that release?
To assess potential MtBE releases, we will locate sampling points near the USTs, the dispenser islands, the product piping, and any suspected surface source (e.g., any low lying areas that may collect surface water runoff, seams between the concrete apron and the asphalt, major cracks in the concrete or asphalt, surface staining, etc.). Given the nature of the soil-gas, soil, and groundwater data to be collected, we do not anticipate that the data will support conclusions regarding what system component may be the source (i.e., whether the release is from an elbow in the piping or just anywhere along the piping run). However, if the data collected clearly indicate a specific source at a given site, we will report that finding.

How will you distinguish between an old and new release?
The site selection process, which involves a file review and site inspection, has been designed to eliminate a site from the Study if the site has had a known old release or potential MtBE release, or if the site is located near a site with a known prior release. In this way, the majority of old releases will be eliminated from consideration before on-site investigations begin. If MtBE is detected at a given site, we will analyze several technical factors in evaluating the source and timing of the apparent release, including,

- The presence of other oxygenates (e.g., Tertiary-Amyl Methyl Ether [TAME], a gasoline additive that has been in use only during the last few years).
- Previous land use; whether the upgraded UST system was installed in a previous UST excavation (i.e., the UST was replaced) or was installed in a new excavation; whether any surface spills have been reported for the site; and whether on site or nearby sources for petroleum hydrocarbons are evident.

On the basis of the technical analysis, we will develop potential release scenarios to help clarify if the upgraded USTs are protective of groundwater quality, and ultimately, drinking water.

Can the station owners/operators receive a copy of the report before it goes to the SCVWD?
After we have conducted a quality assurance/ quality control (QA/QC) review of the laboratory data, the data are to be submitted to the District for review before the District can release it to individual station owners/operators. We anticipate that a copy of the final report for each site will be provided to the property owner. In addition, all final data reports will be in a file maintained by the SCVWD and available for public review.

Can the station owners/operators collect samples during the investigations?
Yes, as long as the sampling does not interfere with the progress of the investigation. We would like to conduct the field investigations as quickly and efficiently as possible to reduce disruptions to the site operator and to control costs.

What about the wastes generated during the investigation?
The SCVWD will assume responsibility for all waste soil and groundwater generated during the investigation. The field methods to be used for the Study (e.g., direct push methodology) were selected to minimize the generation of waste soil and groundwater. We will coordinate with the SCVWD to ensure that all waste generated is properly labeled and that the material is removed from the site as quickly as possible. During the initial site inspection, we will ask the station operator to identify the best location for temporary storage of the waste (likely 1 drum of water and 2-3 buckets of soil).

The certificate recognizes

US Postal Service

at 1750 Lundy Avenue, San Jose, CA

as a

Good Neighbor

in Santa Clara County

This facility has voluntarily agreed to participate in the Santa Clara Valley Water District's **Pilot Study of Operating Underground Storage Tanks.** Results of the Pilot Study will be used in planning for the protection and preservation of drinking water supplies in Santa Clara County.

APPENDIX 2

SITE INSPECTION FORMS

Site Inspection Information

Site ID

Distance of pump island to storm drain

Condition of apron around pumps "poor";"fair";"good"

Evidence of recent paving or regrading? ☐

- location of recent paving/regrading

Description of surface drainage

Direct route for surface spills to the subsurface? ☐

- Description of route to subsurface

Other potential petroleum sources? ☐

- Description of other petroleum sources

Nearby surface water? ☐

- Name of surface water
- type of surface water "lake";"river";"stream";"pond"

USA utility locations confirmed? ☐

- Comments on utility locations

CPt locations marked? ☐

Soil gas locations marked? ☐

Site contact information verified? ☐

Station personnel cooperative? ☐

Station personnel concerned about work hours? ☐

- Describe concern

Station demands off-peak work scedule? ☐

- Describe the schedule demanded

Station demands night work? ☐

Station personnel understand work to be done? ☐

Other concerns of station personnel

Date and time gasoline delivered

Soil and groundwater sample locations marked? ☐

Location of storage for drums

Location of water source

Number of monitoring wells on the site

Other comments:

UST System Information

Site ID		
Source of UST system information		file review, site visit
Tank tightness records available?		
Date of last test		within 6 months;within last year;>1 year;>2 year
Method of tank testing		overfill method;vacuum test; automatic tank gauging
Tank leak rate		
UST overfill prevention system present?		
Type of system		overfill limiter drop tube; vent ball float check-valve; both
Automatic shut-off		
System operational?		
Overfill containment		none;5 gal;15 gal;other
Drop tube equipped with striker plate?		
Under island containment present?		
Under island containment monitoring		liquid vapor;float switch;none
Quick release dispenser hoses?		
Alarm system functional?		
Type		shut-off;slow down
Vents		
Vent type		manifolded;dedicated
Vent piping		single-walled; double contained
Condition of UST turbine sump:		poor;fair;good
Condition of UST flex line sump:		poor;fair;good
Monitoring systems operational?		
Monitoring Systems Op Comment		
Tank annular space monitoring		vapor; liquid probe; SIR; none
Overfill containment monitoring system		vapor;Liquid probe; none
Piping leak detection		pressure line loss; liquid probe; vapor detection; combined
Is system monitored?		
Station inventory records available?		
Records up to date?		
Records complete?		
Supplier log reviewed?		
Supplier log comments		
Spill log reviewed?		
Spill log comments		
Personnel training		
Depth to GW:		
Depth to bottom of tank		
Comments		

APPENDIX 3

INVESTIGATION AND LABORATORY PROCEDURES

Introduction

LFR prepared a Quality Assurance Project Plan (QAPP; LFR 1998a) and Work Plan (LFR 1998b) to describe the decision-making process and procedures to be used during the *Investigation of MtBE Occurrence Associated with Operating UST Systems* in Santa Clara County. Procedures described in both the QAPP and Work Plan were followed throughout the investigation.

The QAPP specified the quality assurance (QA) organization and functional activities associated with site work and the quality control (QC) criteria established to achieve the data quality objectives (DQOs). The Work Plan explained the investigation strategy and detailed the specific tasks to be conducted. QA was designed to ensure that the precision, accuracy, completeness, comparability, and representativeness of data generated during the project met the defined DQOs. QC was applied to achieve the prescribed performance standards (in monitoring and measurement) during project planning, field activities, sample analysis, sample and data handling, and data evaluation and interpretation. The combined QA/QC program was applied to ensure that the work conducted during the investigation fulfilled the identified DQOs.

The primary data quality objective (DQO) was that the data must conclusively indicate the presence or absence of MtBE in the subsurface. Secondary objectives were that the data must correlate to the system materials and construction, and document subsurface lithology and hydrogeologic conditions. Overall, the data must be comparable in terms of methodology, analysis, and reporting across the Study site population.

Study Consistency. LFR maintained consistency of strategy implementation across the 28-site investigation by implementing program management controls. Those controls included:

- Selection of the initial sampling locations at all Study sites by the Project Study Administrator and Deputy Program Manager
- Subcontract personnel dedicated to performing the same investigation technique at all sites investigated
- Collection of cone penetrometer data at each site where on-site access was granted, to effectively target contaminant zones and provide County-wide data representative of subsurface conditions
- Personnel dedicated to refining the dynamic conceptual models for all sites investigated
- Program Management working group review (Program Manager, Director of Technical Evaluations, and/or MtBE Specialist) of the conceptual models for all sites investigated

In addition, laboratory analysis was performed by the same set of laboratories throughout the investigation, including

Laboratory Name/Location	Type of Laboratory	Sample Types
InterPhase, Los Angeles, CA	Mobile	Soil Gas, On Site
Air Toxics, Folsom, CA	Fixed	Soil Gas QC
Alpha Analytical, Sparks, NV	Fixed	Soil and Groundwater

Data Precision and Completeness. QC criteria for data precision and accuracy were the QC limits established by the laboratory based on the historical performance of the laboratory for specified methods. Method detection limits were detection limits specified in the analytical method or the lowest practical detection limits achievable by the laboratory.

Standard Operating Procedures and Reporting Units. To ensure the comparability of the data collected, LFR followed the standardized procedures outlined in the QAPP during field sampling, laboratory analysis, and data evaluation and interpretation.

Sampling Procedures and Chemical Analysis

The Study Team conducted cone penetrometer testing (CPT) and collected soil-gas, soil, and groundwater samples at each of the study sites. The sequencing of these investigation techniques was developed to ensure that areas of contamination were effectively targeted and, within the scope of the Study, conclusive data were generated to evaluate the association between MtBE in groundwater and operating USTs in Santa Clara County.

Cone Penetrometer Testing

Gregg In-Situ ("Gregg") of Martinez, California, performed the CPT work as directed by an LFR State Registered Geologist. Gregg used a truck-mounted, hydraulic ram with an approximate weight of 25 tons to push the CPT probe attached to a string of steel pipe segments into the ground. The probe was advanced at an approximate rate of 2 centimeters per second, and measurements were continuously recorded for direct relay to an on-board computer. The computer documented the lithologic and hydrologic data based on cone tip resistance, sleeve friction, and pore water pressure measured by the cone-tipped probe as the probe was advanced. At the conclusion of data collection, the CPT boring was grouted to approximately 1 to 2 feet below ground surface (bgs) using an SCVWD-approved cement/bentonite slurry applied through a tremie pipe. The remainder of the boring was filled with topsoil, asphalt, or concrete to match site surface conditions.

Equipment Decontamination. To minimize the potential for cross contamination between CPT boring locations, the field equipment was thoroughly cleaned after each use by washing with high-pressure hot water and or washing with Alconox and rinsing with deionized, distilled, or fresh water. The drilling equipment was again washed with high-pressure hot water before use in each boring.

Soil-Gas Probe Installation and Sample Collection

InterPhase of Los Angeles, California, conducted the soil-gas survey at each site as directed by an LFR State Registered Geologist or Professional Engineer. InterPhase used a truck-mounted hydraulic push unit to drive a 1-1/4-inch-diameter steel probe tipped with an expendable steel point into the soil.

Upon reaching the desired sampling depth, a section of inert, 1/4-inch-outer-diameter polyethylene tubing attached to a fitting called the PRT, was inserted down through the center of the steel rods and connected to a fitting at the bottom of the rods, called the point holder just above the drive point. The steel probe was then retracted a minimum of 1/2-inch to expose the gas sampling ports to soil gas. Purge volume tests of varying purge volumes (typically 2, 3, and 4 volumes) were conducted using a 60-cubic-centimeter (cc) syringe at each sampling depth to assess which volumes yielded the highest analytical results. These volumes were then used when purging before collecting subsequent samples at that site. Vacuum and PID measurements were recorded during purging to evaluate the representativeness of the soil-gas sample.

Soil gas was sampled using 10 cc, calibrated, gas-tight syringes. New syringes were used at each sampling interval. The syringes were plugged and transferred to the mobile laboratory for analysis. All soil-gas samples (including duplicate samples) collected in a syringe were analyzed within 30 minutes of sample collection.

Leak detection tests were performed on the PRT/point holder connections, and the rod/point holder connections. In each test, a rubber stopper (with a gauge specially designed to fit into the stopper) was used to seal one end of the system being tested. The 60 cc purging syringe was used to pull a vacuum from the other end of the system while gauge readings were taken. If the gauge registered a high and unchanging vacuum during this procedure, it was concluded that there was no leak. Results of leak testing were recorded in the daily field notes.

LFR also collected approximately one soil-gas sample from each site in a 6-liter Summa canister for the EPA Method TO-14 analysis. Summa canisters are polished, stainless steel canisters that are cleaned and evacuated by the laboratory that provides them. Evacuation of the Summa canister must result in a pre-sample pressure of –30″Hg +/- 10%. Prior to collecting a sample, the canisters were checked for appropriate pressure in the field using a pressure gauge with a threaded fitting. Canisters that did not exhibit appropriate pressures were not used for sample collection.

Soil-gas samples were collected in the canister by connecting a section of Teflon tubing between the downhole tubing and a 7-micron filter connected to the canister. The Teflon tubing was fitted to the filter with a rubber ferrule and threaded nut. The canister valve was then slowly opened. The evacuated canister was allowed to equilibrate by leaving the valve open for a minimum of 30 seconds. Generally, equilibration was determined by the subsidence of audible flow into the canister. Upon sample collection, the Summa valve was closed and the vacuum on the canister was checked. The final vacuum was noted on field documents and labels.

Equipment Decontamination. Soil-gas probe parts were cleaned between uses to minimize the potential for cross contamination between sampling locations. Downhole steel parts (points, point holders, PRTs, and adapters) and syringes were cleaned by baking the parts in a convection oven at 150 degrees Celsius. Soil on the rods was cleaned off by brushing, and the rods were washed with Alconox and rinsed as appropriate. New lengths of polyethylene tubing and new sampling syringes were used at each sampling interval of each sampling location, whether a sample was successfully collected or not.

Soil Sampling

Direct Push Drilling Method. Precision Sampling, Inc. (″Precision″), of San Rafael, California, conducted soil and groundwater sampling for the Study as directed by an LFR State Registered Geologist. Precision used a dual-tube drilling method to reduce the potential for cross contamination. A hollow steel rod was pushed into the soil using a hydraulic jack-hammer system. The hollow rod consists of an inner sampling rod within a larger-diameter outer rod, which serves as a temporary drive casing. During soil sampling, the two nested rods were simultaneously driven into the soil at approximately 3-foot increments. A soil core was collected in a 3-foot-long sample barrel attached to the inner sampling rod. The sampling barrel was lined with new, stainless steel tubes or buterate liners for each sampling run. The larger-diameter outer rod remained in place during soil sampling to prevent collapse of the boring, while the inner rod and soil sampling barrel were retrieved using a hydraulic winch. After sample retrieval, an unused or cleaned sample barrel containing unused or cleaned sample liners was attached and the inner rod was placed back into the borehole. Additional 3-foot sections of inner and outer rods were then attached at the surface, and the sampler was driven another 3 feet into the soil.

Hollow-Stem Auger Drilling Method. If it was not possible to advance soil borings using the direct push technology, a standard hollow-stem auger drill rig was used. Gregg Drilling & Testing of Martinez or Spectrum Drilling of Stockton, California, provided this service as directed by an LFR State Registered Geologist. The drill rig was equipped with a minimum 6 7/8-inch, outside-diameter hollow-stem auger. Soil samples were collected on a continuous basis using a 3-inch-diameter,60-inch-long continuous core sample. Target intervals were sampled by pushing a 6-inch-long stainless steel tube into the retrieved soil sample until filled or by driving an 18-inch-long core barrel lined with stainless steel tubes at the desired depth. The shoe of the sample barrel extended out in front of the lead auger bit as the boring was advanced, allowing the sample barrel to be filled with undisturbed material during the drilling process.

Visual Inspection and Lithologic Description of Soil Samples. Soil samples were field screened for organic vapors using a photoionization detector (PID). PID readings and soil descriptions were recorded on field boring logs. The LFR State Registered Geologist examined and described the soil samples in accordance with the Unified Soil Classification System. A copy of the lithologic log for each boring was included in each of the individual site reports, which are provided in Volume 2 of the Summary Report.

Packaging of Soil Samples. Soil samples in stainless-steel tubes or hand-cut buterate liners collected for laboratory analyses were sealed using Teflon sheets and caps. The samples were labeled, stored and shipped in accordance with the procedures outlined in Section 5.0 of the QAPP.

Sealing of Boreholes. When sampling was completed, the borings were sealed with a SCVWD-approved cement/bentonite slurry. The slurry was pumped into the boring through a tremie pipe placed in the bottom of the boring to approximately 1 to 2 feet bgs. The remainder of the boring was filled with topsoil, asphalt, or concrete to match existing site surface conditions or as directed by the permitting public works department.

Equipment Decontamination. To minimize the potential for cross contamination between sampling locations, equipment used during investigation activities that may have come into contact with potentially chemically affected materials was thoroughly cleaned after each use by washing with high-pressure hot water and/or washing with Alconox, and rinsing with deionized, distilled, or fresh water. The drilling equipment was washed, including drill pipe and soil samplers, and so forth, using high-pressure hot water before use in each boring.

The soil samplers were cleaned between soil sampling intervals with an Alconox solution and potable water.

Groundwater Sampling

Groundwater samples were collected using a variety of methods that were selected based on the site lithology and type of drilling technique used. At several of the sites, Precision was able to use a modified Simulprobe® that allowed LFR to collect groundwater samples ahead of the dual tube casing. Using this method, a small screen point system was driven in front of the casing; the screen was exposed; and water flowed in through the screen and up into a stainless steel chamber. The modified Simulprobe® was then pulled out of the hole and the groundwater sample was decanted into laboratory-supplied containers. Depending on site conditions, groundwater samples were also collected using a discrete screen point sampler or temporary PVC slotted casing. This methodology was only successful when there was sufficient hydraulic head to fill the canister. Groundwater samples at the remaining sites were collected either by placing temporary PVC casing and screen into the borehole and collecting a sample with a bailer, or collecting a groundwater sample directly from the borehole (through the augers) with a bailer. Generally, the use of the Simulprobe was only attempted if the Geologist and the driller believed that a sufficient zone of saturation had been penetrated. Bailing was used exclusively when hollow-stem auger drilling was used.

Chemical Analysis Methods

LFR submitted soil-gas, soil, and groundwater samples for analysis using the following methods:

Method	Media	Parameter	Laboratory
EPA 8020	Soil gas	BTEX; MtBE	InterPhase
EPA 8015 Modified		TPHg	InterPhase
TO-14 Modified		BTEX; Fuel oxygenates	Air Toxics
EPA 8260	Soil	BTEX; Fuel oxygenates	Alpha Analytical
EPA 8015 Modified		TPHg	Alpha Analytical
EPA 8260	Groundwater	BTEX; Fuel oxygenates	Alpha Analytical
EPA 8015 Modified		TPHg	Alpha Analytical

BTEX = Benzene, toluene, ethylbenzene, and xylenes
MtBE = Methyl tert-butyl ether
TPHg = Total petroleum hydrocarbons as gasoline
Fuel Oxygenates = MtBE, tertiary-amyl methyl ether (TAME), diisopropyl ether (DIPE), ethyl tertiary-butyl ether (ETBE), and tert-butyl alcohol (TBA)

Appendices A, B, and C of the QAPP provide the relevant Standard Operating Procedures for InterPhase, Air Toxics Ltd., and Alpha Analytics, respectively.

QA/QC Evaluation of Analytical Data

The following is a summary of the quality assurance/quality control (QA/QC) evaluation of soil, groundwater, and soil-gas analytical data. The data were reviewed by LFR in accordance with the procedures outlined in the Quality Assurance Project Plan (QAPP) (LFR 1998a).

General Information. A total of 342 soil-gas samples were collected and analyzed on-site by InterPhase of Los Angeles, California. Nineteen split soil-gas samples were collected and submitted for analysis to Air Toxics, Ltd., of Folsom, California. Soil-gas samples were analyzed on site for BTEX plus MtBE and TPH(g) using U.S. EPA Method 8020 and 8015 Modified, respectively, and at the off-site laboratory for BTEX plus oxygenates using EPA Method TO-14.

A total of 378 soil and 157 groundwater samples were collected and submitted for analysis to Alpha Analytics, Inc., of Sparks, Nevada (a state-certified laboratory). Samples were analyzed for BTEX plus oxygenates and TPH(g) using EPA Method 8260.

Based on LFR′s QA/QC review of data received from the analytical laboratories, the data are valid and available for use, with the exception of several sample results that have been flagged with qualifiers as follows:

In accordance with the EPA′s Contract Laboratory Program National Functional Guidelines for Organic Data Review (″EPA Guidelines″; EPA, dated February 1994), the flags J and UJ denote the following datum qualifiers:

- J - The analyte was positively identified; the associated numerical values are the approximate concentration of the analyte in the sample.
- UJ - The analyte was not detected above the reported sample quantitation limit. The reported quantitation limit, however, is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Parameters that were reviewed included all parameters outlined in the QAPP, including QC sample spikes, blanks, holding times, reporting limits, completeness, continuing calibration, and documentation (chain-of-custody).

Blanks. The results of all laboratory method blanks analyzed for BTEX plus oxygenates and TPH(g) indicated that no target compounds were detected above the laboratory reporting limits in the laboratory method blanks.

MtBE was detected at a concentration of 0.61 ug/L in an equipment rinsate blank collected on March 31, 1998. MtBE was not detected in any of the associated samples; therefore, no MtBE results were qualified. No target compounds were detected above the laboratory reporting limits in any other equipment rinsate, trip, or source water blanks that were analyzed.

Laboratory Control Sample Spikes. The laboratory control sample (LCS) spike percent recovery (SPR) values for BTEX plus oxygenates and TPH(g) were all within the laboratory control limits. Therefore, no qualification was necessary based on this QC criteria.

Surrogate Spikes. The surrogate SPR values for BTEX plus oxygenates using EPA Method 8260 associated with samples 505-BH-06-25.0-WO and 597-BH-06-17.0-22.0-WO exceeded the upper laboratory control limit. In accordance with the EPA Guidelines for surrogate spike evaluation, the assorted detections in associated samples are flagged as estimated values with ″J″ qualifiers. MtBE and TBA were detected in the associated sample 505-BH-06-25.0-WO at concentrations of 2,300 ug/L and 1,100 ug/L, respectively. No target compounds were detected above the laboratory reporting limits in sample 597-BH-06-17.0-22.0-WO. All other surrogate SPR values were within laboratory control limits.

Matrix Spikes. The matrix spike (MS) and matrix spike duplicate (MSD) percent recovery values for BTEX plus oxygenates and TPH(g) for soil and groundwater samples were all within the laboratory control limits. Therefore, no qualification was necessary on the basis of this QC criterion.

Holding Time. All samples for BTEX plus oxygenates using EPA Methods 8020, 8260, and TO-14 and TPH(g) by EPA Methods 8015 Modified and 8260 were analyzed within EPA recommended hold time of 14 days, with the exception of four samples. Sample 597-BH-04-9.5-25-W-D-X was analyzed one day outside of the recommended hold time. Samples 261-BH-01-22-WP, 261-BH-02-22-WP, and 261-BH-03-22-WP were re-run outside of the recommended hold time to achieve lower reporting limits as requested by LFR. Results associated with these samples are flagged as estimated values with ″J″ and ″UJ″ qualifiers.

Reporting Limits. The method-specific reporting limits for each of the samples are presented in the original laboratory reports. Dilution was required for samples with high concentrations of target analytes, which resulted in elevated reporting limits. Approximately 2%, 13%, and 1% of all soil, groundwater and soil-gas samples, respectively, had elevated reporting limits because of high concentrations of target analytes.

Field Duplicates. All relative percent difference (RPD) values of field duplicates were below the control limit of 30%; therefore, no qualification was necessary on the basis of this QC criterion.

Summary of Data QA/QC Evaluation

Review of the QA/QC data associated with the soil, groundwater, and soil-gas sampling events resulted in the following special qualifiers for sample results:

- Detections of MtBE and TBA in the associated sample 505-BH-06-25.0-WO are flagged as estimated values with ″J″ qualifiers because surrogate SPR values were outside laboratory control limits.
- BTEX plus oxygenate results for samples 597-BH-04-9.5-25-W-D-X, 261-BH-01-22-WP, 261-BH-02-22-WP, and 261-BH-03-22-WP are flagged as estimated values with ″J″ and ″UJ″ qualifiers because recommended analysis holding time was exceeded. Sample 597-BH-04-9.5-25-W-D-X was analyzed one day outside of the recommended hold time. Samples 261-BH-01-22-WP, 261-BH-02-22-WP, and 261-BH-03-22-WP were re-run outside of the recommended hold time to achieve lower reporting limits, as requested by LFR.
- Sample dilution was necessary because of high concentrations of target analytes for approximately 2%, 13%, and 1% of all soil, groundwater and soil-gas samples, respectively, resulting in elevated reporting limits for those samples.

References

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______. 1986. *Test Methods for Evaluating Solid Waste*. EPA SW-846, EPA, Third Edition. November.

APPENDIX 4

SUMMARY LABORATORY DATA TABLES

Maximum Concentrations in Groundwater, Soil, and Soil Gas

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Groundwater			Soil			Soil Gas		
	MTBE ug/L	**Benzene ug/L**	**TPH as Gasoline mg/L**	**MTBE ug/Kg**	**Benzene ug/Kg**	**TPH as Gasoline mg/Kg**	**MTBE ug/L**	**Benzene ug/L**	**TPH as Gasoline ug/L**
261	200000	1.3	ND	15000	13	31	820	4.6	17000
332 *	26000	ND	4.6	1800	ND	ND	NS	NS	NS
505	25000	ND	ND	2400	ND	ND	68	0.018	570
073	6700	0.51	ND	11	ND	ND	0.011	0.0091	170
342	1700	3.6	ND	140	ND	5.6	91	ND	9245
287	800	11	ND	ND	25	49	20	0.081	1500
598	280	2.8	0.38	260	ND	95	520	54	71000
592	40	ND	ND	110	ND	ND	580	24	12000
597 *	27	ND	ND	8.4	ND	ND	NS	NS	NS
437	19	ND	ND	ND	ND	13	ND	ND	100
196 *	8.5	ND	ND	800	ND	ND	NS	NS	NS
489 *	1.9	ND	ND	ND	ND	ND	NS	NS	NS
594 *	1.6	1.4	0.08	18	5700	1300	NS	NS	NS
065	ND	ND	ND	49	9.9	ND	ND	0.0039	ND
596 *	ND	ND	ND	10	ND	ND	NS	NS	NS
153 *	ND	ND	ND	8.3	ND	ND	NS	NS	NS
571	ND	ND	ND	8.1	ND	ND	ND	0.0042	ND
586	ND	37	12	6.9	ND	ND	0.026	0.0084	ND
405	ND	ND	ND	ND	ND	ND	8.1	0.22	690
593	ND	ND	ND	ND	ND	ND	7.8	0.0048	ND
490	ND	ND	ND	ND	ND	1	0.23	0.045	ND
289	ND	ND	ND	ND	ND	ND	0.048	0.025	ND
470	ND	ND	ND	ND	ND	ND	0.015	0.0081	160
071 *	ND	ND	ND	ND	ND	ND	NS	NS	NS
145 *	ND	ND	ND	ND	ND	ND	NS	NS	NS
422 *	ND	ND	ND	ND	ND	ND	NS	NS	NS
556 *	ND	ND	ND	ND	ND	ND	NS	NS	NS
595	NS	NS	NS	ND	ND	ND	310	35	16400

* = Samples collected from an off-site location

ND = Not detected - All samples were reported as non-detects for this analyte.

NS = Not sampled - Samples were not collected.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
065	065-SG-01	11/23/98	5	<5	<100	<1	<1	<1	5.7	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			16	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			30	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
065	065-SG-02	11/23/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	2.8	na	na	na	na	na	na
			16	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	065-SG-02-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
065	065-SG-03	11/23/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	5.8	<1	<1	na	na	na	na	na	na
			16	<5	<100	<1	<1	<1	<1	1.4	na	na	na	na	na	na
065	065-SG-04	11/23/98	5	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
065	065-SG-05	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
065	065-SG-06	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
065	065-SG-07	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	065-SG-07-SPL			<0.010	na	0.0039 J	0.0044 J	0.031	0.018 J	0.0057 J	0.017	<0.095	<0.022	ND	ND	ND
065	065-SG-08	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	065-SG-08-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
073	073-SG-01	11/13/98	6	<5	110	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	120	<1	<1	<1	<1	<1	na	na	na	na	na	na
			19	<5	170	<1	<1	<1	<1	<1	na	na	na	na	na	na
			28	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
073	073-SG-02	11/13/98	6	<5	<100	<1	<1	2.8	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
073	073-SG-03	11/13/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
073	073-SG-03	11/13/98	12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	073-SG-03-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	073-SG-03-SPL			0.011 J	na	0.0091	0.0033 J	0.016	0.011 J	0.0044 J	0.018	<0.091	<0.021	ND	ND	ND
073	073-SG-04	11/13/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
073	073-SG-05	11/13/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
073	073-SG-06	11/13/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
261	261-SG-01	11/10/98	5	25	2700	<1	<1	9.1	<1	<1	na	na	na	na	na	na
	261-SG-01-SPL			0.17	na	0.013	0.0075 J	0.027	0.032	0.011 J	0.029	<0.10	0.0074 J	ND	ND	ND
	261-SG-01		13	130	790	<1	<1	7.3	<1	<1	na	na	na	na	na	na
			19	280	900	<1	<1	10	1.6	<1	na	na	na	na	na	na
261	261-SG-02	11/11/98	5	8.1	1300	<1	<1	4.3	<1	<1	na	na	na	na	na	na
			13	5.6	610	<1	<1	3	<1	<1	na	na	na	na	na	na
261	261-SG-03	11/11/98	5	62	3000	<1	<1	28	<1	<1	na	na	na	na	na	na
			12.5	5.4	<100	<1	<1	2.2	<1	<1	na	na	na	na	na	na
261	261-SG-04	11/11/98	5	6.6	13000	<1	3.4	12	<1	<1	na	na	na	na	na	na
			13	5.9	1100	<1	<1	9.1	2.4	<1	na	na	na	na	na	na
			18	<5	430	<1	<1	2	<1	<1	na	na	na	na	na	na
261	261-SG-05	11/10/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	6.6	<1	na	na	na	na	na	na
			19	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
261	261-SG-06	11/10/98	5	<5 UJ	<100 UJ	<1 UJ	<1 UJ	<1 UJ	7.6 J	<1 UJ	na	na	na	na	na	na
	261-SG-06-DUP			<5	<100	3.5	<1	<1	6.8	<1	na	na	na	na	na	na
	261-SG-06		13	<5	110	4.6	<1	<1	<1	<1	na	na	na	na	na	na
261	261-SG-07	11/10/98	5	7.4	1100	<1	<1	15	<1	<1	na	na	na	na	na	na
			13	26	380	<1	3.6	24	<1	<1	na	na	na	na	na	na
			19	820	17000	<1	<1	980	<1	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
261	261-SG-08	11/11/98	5	<5	480	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5 UJ	<100 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	na	na	na	na	na	na
261	261-SG-09	11/11/98	5	<5	2800	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5	1500	<1	<1	<1	<1	<1	na	na	na	na	na	na
261	261-SG-10	11/11/98	5	<5	750	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5	140	<1	<1	<1	<1	<1	na	na	na	na	na	na
287	287-SG-01	1/6/99	12.5	<5	<100	<1	<1	<1	1.9	<1	na	na	na	na	na	na
			21.5	<5	<100	<1	<1	<1	5	<1	na	na	na	na	na	na
287	287-SG-02	1/7/99	12	12	1500	<1	<1	43	12.0	15	na	na	na	na	na	na
	287-SG-02-DUP			20	1300	<1	<1	39	9.2	7.6	na	na	na	na	na	na
	287-SG-02-SPL			<0.1	na	0.081 J	0.77	0.056 J	2.5	0.18	<0.053	<0.93	<0.21	ND	ND	ND
	287-SG-02		21.5	11	1200	<1	<1	27	3.7	<4.8	na	na	na	na	na	na
			36	<5	<100	<1	<1	4.4	<1	<1	na	na	na	na	na	na
287	287-SG-03	1/7/99	10	<5	<100	<1	<1	<1	5.4	<1	na	na	na	na	na	na
			20	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	287-SG-03-SPL			0.022 J	na	0.0082 J	0.0073 J	0.038	0.032	0.011 J	0.034	<0.094	<0.022	ND	ND	ND
	287-SG-03		37	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
289	289-SG-01	3/15/99	8	<5	<100	<1	<1	1.0	<1	<1	na	na	na	na	na	na
289	289-SG-02	3/16/99	10	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	289-SG-02-SPL			0.048	na	0.025	0.082	0.41	0.36	0.11	0.046	0.23	<0.024	7.9	ND	ND
289	289-SG-03	3/16/99	10	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
342	342-SG-01	1/12/99	8	26	<100	<1	1.3	8.3	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	3	<1	<1	<1	na	na	na	na	na	na
342	342-SG-02	1/12/99	8	45	<100	<1	<1	3.7	1.4	<1	na	na	na	na	na	na
	342-SG-02-SPL			91	na	<0.23	<0.31	<0.27	0.51 J	<0.31	<0.53	<9.3	<2.1	ND	ND	ND
342	342-SG-03	1/13/99	8	45	<100	<1	<1	7.4	<1	1.6	na	na	na	na	na	na
			10	52	107	<1	2.6	14	<1.2	1.6	na	na	na	na	na	na
342	342-SG-04	1/13/99	8	<5	<100	<1	<1	1.9	<1	<1	na	na	na	na	na	na
342	342-SG-05	1/13/99	8	<5	<100	<1	<1	1.0	1.3	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
342	342-SG-06	1/13/99	8	63	9245 J	<1	6.0	33	<1	<1	na	na	na	na	na	na
	342-SG-06-DUP			65	9163 J	<1	1.5	34	<1	<1	na	na	na	na	na	na
342	342-SG-07	1/13/99	8	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
405	405-SG-01	1/8/99	10	<5	<100	<1	4.6	3.8	<1	<1	na	na	na	na	na	na
405	405-SG-02	1/11/99	10	<5	<100	<1	<1	1.3	3.6	<1	na	na	na	na	na	na
			20	8.1	690	<1	5.7	2.9	<1	3.8	na	na	na	na	na	na
	405-SG-02-SPL			1.1	na	0.22	0.11 J	1.0	0.39	0.12 J	0.12 J	<1.2	<0.29	ND	ND	ND
405	405-SG-03	1/11/99	10	<5	<100	<1	4.9	<1	<1	<1	na	na	na	na	na	na
	405-SG-03-DUP			<5	<100	<1	2.7	<1	<1	<1	na	na	na	na	na	na
	405-SG-03		20	<5	<100	<1	1.9	1	<1	<1	na	na	na	na	na	na
405	405-SG-04	1/11/99	10	<5	<100	<1	<1	<1	1.6	1.3	na	na	na	na	na	na
405	405-SG-05	1/11/99	10	<5	<100	<1	<1	<1	1	<1	na	na	na	na	na	na
			20	<5	<100	<1	<1	1.0	1.7	<1	na	na	na	na	na	na
437	437-SG-01	1/14/99	8	<5	<100	<1	<1	<1	3.2	<1	na	na	na	na	na	na
437	437-SG-02	1/14/99	8	<5	<100	<1	<1	<1	1.4	<1	na	na	na	na	na	na
			15	<5	<100	<1	<1	<1	2.3	<1	na	na	na	na	na	na
437	437-SG-03	1/14/99	8	<5	100	<1	<1	<1	<1	<1	na	na	na	na	na	na
437	437-SG-04	1/14/99	8	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	437-SG-04-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
437	437-SG-05	1/14/99	8	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			15	<5	<100	<1	<1	<1	<1	6.3	na	na	na	na	na	na
437	437-SG-06	1/14/99	8	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
470	470-SG-01	11/12/98	5	<5	100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	470-SG-01-SPL			0.015 J	na	0.0081 J	0.0071 J	0.023	0.019 J	0.0075 J	0.034	<0.091	<0.021	ND	ND	ND
	470-SG-01		12.5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
470	470-SG-02	11/12/98	5	<5	<100	<1	4.5	<1	<1	<1	na	na	na	na	na	na
			12.5	<5	120	<1	<1	<1	<1	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
470	470-SG-03	11/12/98	5	<5	130	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12.5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
470	470-SG-04	11/12/98	5	<5	120	<1	<1	2.5	<1	<1	na	na	na	na	na	na
	470-SG-04-DUP			<5	120	<1	<1	<1	<1	<1	na	na	na	na	na	na
	470-SG-04		13	<5	120	<1	<1	<1	<1	<1	na	na	na	na	na	na
			21	<5	120	<1	<1	<1	<1	<1	na	na	na	na	na	na
470	470-SG-05	11/12/98	5	<5	100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5 UJ	<100 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	<1 UJ	na	na	na	na	na	na
470	470-SG-06	11/12/98	5	<5	160	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12.5	<5	110	<1	<1	<1	<1	<1	na	na	na	na	na	na
			21	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-01	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-02	11/24/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-03	11/25/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			15	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-04	11/25/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-05	11/25/98	6	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	490-SG-05-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
490	490-SG-06	11/25/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	6.1	na	na	na	na	na	na
	490-SG-06-SPL			0.23	na	0.045	0.053	0.33	0.23	0.066	0.011 J	<0.089	<0.021	ND	ND	ND
490	490-SG-07	11/25/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-01	11/16/98	5	<5	161	<1	<1	<1	<1	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
505	505-SG-01	11/16/98	13	<5	150	<1	<1	1.2	<1	<1	na	na	na	na	na	na
			28	9.9	230	<1	<1	<1	<1	<1	na	na	na	na	na	na
	505-SG-01-SPL			1.2	na	0.018	0.010 J	0.042	0.043	0.017	0.057	0.25	0.046	ND	ND	ND
505	505-SG-02	11/16/98	5	<5	200	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	5.8	170	<1	<1	<1	<1	<1	na	na	na	na	na	na
			25	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	505-SG-02-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-03	11/16/98	5	10	270	<1	<1	1.1	<1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-04	11/16/98	5	<5	570	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5	180	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-05	11/17/98	5	24	300	<1	8.4	5.9	<1	<1	na	na	na	na	na	na
			13	38	160	<1	<1	2.7	4.4	<1	na	na	na	na	na	na
			28	61	310	<1	<1	4.7	<1	<1	na	na	na	na	na	na
	505-SG-05-DUP			68	350	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-06	11/17/98	5	9.8	290	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	6.0	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
505	505-SG-07	11/17/98	5	<5	<100	<1	<1	1.1	<1	<1	na	na	na	na	na	na
			13	<5	105	<1	<1	1.5	2	<1	na	na	na	na	na	na
505	505-SG-08	11/17/98	5	<5	160	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5	420	<1	<1	<1	<1	<1	na	na	na	na	na	na
			28	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-01	11/18/98	5	<5	<100	<1	<1	<1	4.1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			18	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-02	11/18/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			16.5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-03	11/18/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na

See all notes and definitions of data qualifiers on the last page of this table.

Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
571	571-SG-04	11/18/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	571-SG-04-SPL			<0.010	na	0.0042 J	<0.0029	0.010	0.010 J	0.0032 J	0.023	<0.088	<0.020	ND	ND	ND
	571-SG-04		12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	571-SG-04-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-05	11/18/98	5	<5	<100	<1	<1	1.5	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-06	11/19/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
571	571-SG-07	11/19/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
586	586-SG-01	11/19/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			28	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
586	586-SG-02	11/19/98	5	<5	<100	<1	<1	<1	<1	1.3	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			28	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	586-SG-02-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
586	586-SG-03	11/19/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
586	586-SG-04	11/20/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	586-SG-04-SPL			0.026	na	0.0084	0.0071 J	0.033	0.026	0.0088 J	0.014	<0.085	<0.020	ND	ND	ND
586	586-SG-05	11/20/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
586	586-SG-06	11/20/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
586	586-SG-07	11/20/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	586-SG-07-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na

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Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
586	586-SG-08	11/20/98	5	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			12	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			28	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
592	592-SG-01	3/23/99	8	6.1	<100	<1	<1	5.2	5.3	1.8	na	na	na	na	na	na
			13	6.3	<100	<1	2.8	4.7	2.9	1.2	na	na	na	na	na	na
			23	580	6200	<10	<10	37	24	<10	na	na	na	na	na	na
	592-SG-01-SPL			340	na	<2.3	<3.1	<2.7	<3.1	<3.1	770 E	24	<22	ND	ND	ND
592	592-SG-02	3/23/99	8	<5	<100	<1	<1	2.9	1.2	<1	na	na	na	na	na	na
	592-SG-02-DUP			<5	<100	<1	2.7	4	1.7	2.2	na	na	na	na	na	na
	592-SG-02		13	<5	<100	<1	<1	2	5.2	1.9	na	na	na	na	na	na
			23	85	250	<1	<1	3	1.5	<1	na	na	na	na	na	na
592	592-SG-03	3/23/99	8	<5	<100	<1	<1	4.1	2.5	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			23	<5	<100	<1	<1	<1	1.4	<1	na	na	na	na	na	na
592	592-SG-04	3/24/99	8	<5	100	<1	2.8	3	4.1	3.6	na	na	na	na	na	na
			13	<5	<100	<1	4.3	3.3	6.5	2.8	na	na	na	na	na	na
			23	280	12000	24	<1	17	28	8.7	na	na	na	na	na	na
592	592-SG-05	3/24/99	8	<5	140	<1	<1	3.4	9.9	<1	na	na	na	na	na	na
			17	<5	<100	<1	<1	1.5	1.3	<1	na	na	na	na	na	na
			23	<5	<100	<1	<1	3.2	1.6	<1	na	na	na	na	na	na
592	592-SG-06	3/24/99	8	<5	<100	<1	2	4.2	3.2	2.6	na	na	na	na	na	na
			13	280	1200	<1	4.5	6.5	19	<1	na	na	na	na	na	na
592	592-SG-07	3/24/99	8	<5	<100	<1	<1	2	<1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	<1	2.2	<1	na	na	na	na	na	na
			23	<5	2400	<1	<1	<1	5.5	<1	na	na	na	na	na	na
	592-SG-07-DUP			<5	2800	<1	<1	<1	6.1	<1	na	na	na	na	na	na
592	592-SG-08	3/24/99	8	<5	<100	<1	<1	1.2	1.1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
593	593-SG-01	3/25/99	8	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	2.3	3.1	<1	na	na	na	na	na	na

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Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
593	593-SG-01	3/25/99	20	<5	<100	<1	<1	2	<1	<1	na	na	na	na	na	na
593	593-SG-02	3/25/99	8	<5	<100	<1	<1	3.2	<1	<1	na	na	na	na	na	na
			18.5	<5	<100	<1	<1	<1	1.5	<1	na	na	na	na	na	na
	593-SG-02-DUP			<5	<100	<1	<1	1	<1	<1	na	na	na	na	na	na
593	593-SG-03	3/25/99	8	<5	<100	<1	<1	1.3	1.5	<1	na	na	na	na	na	na
593	593-SG-04	3/25/99	8	<5	<100	<1	<1	1	<1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	1.6	2.3	1.4	na	na	na	na	na	na
			20	<5	<100	<1	<1	1.3	<1	<1	na	na	na	na	na	na
593	593-SG-05	3/26/99	8	<5	<100	<1	<1	<1	1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	1.7	<1	<1	na	na	na	na	na	na
			20	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	593-SG-05-SPL			0.033	na	0.0048 J	0.0063 J	0.022	0.029	0.0094 J	0.0099 J	0.48	<0.022	ND	ND	ND
593	593-SG-06	3/26/99	8	<5	<100	<1	<1	1.4	<1	<1	na	na	na	na	na	na
			13	5	<100	<1	<1	2.1	1.2	<1	na	na	na	na	na	na
593	593-SG-07	3/26/99	8	<5	<100	<1	1.3	3.1	1.6	<1	na	na	na	na	na	na
			13	6.2	<100	<1	1.4	2.3	1.2	<1	na	na	na	na	na	na
	593-SG-07-DUP			7.8	<100	<1	<1	2	2	1.2	na	na	na	na	na	na
595	595-SG-01	3/19/99	8	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			13	<5	115	<1	<1	<1	1	<1	na	na	na	na	na	na
			18	<5	<100	<1	<1	1.6	1.1	<1	na	na	na	na	na	na
595	595-SG-02	3/19/99	8	<5	<100	<1	<1	1.9	2.2	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			18	<5	<100	<1	<1	1.1	<1	<1	na	na	na	na	na	na
	595-SG-02-DUP			<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
	595-SG-02-SPL			<0.011	na	0.012	0.0092 J	0.049	0.042	0.013	0.0057 J	<0.096	0.0043 J	ND	ND	ND
595	595-SG-03	3/19/99	8	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	1.1	<1	<1	na	na	na	na	na	na
			18	<5	<100	<1	<1	1.1	1.6	<1	na	na	na	na	na	na
595	595-SG-04	3/19/99	8	<5	<100	<1	<1	2.2	2.4	<1	na	na	na	na	na	na
			13	<5	<100	<1	<1	1.4	<1	<1	na	na	na	na	na	na

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Soil Gas Results Summary

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Date	Depth (ft)	MTBE ug/L	TPH as Gasoline ug/L	Benzene ug/L	Ethyl Benzene ug/L	Toluene ug/L	m/p-Xylene ug/L	o-Xylene ug/L	Ethanol ug/L	Methanol ug/L	Tertiary Butyl Alcohol (TBA) ug/L	n-Butyl Ethyl Ether ug/L	Di-Isopropyl Ether (DIPE) ug/L	Tertiary Amyl Methyl Ether (TAME) ug/L
595	595-SG-04	3/19/99	18	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
		3/24/99	23	310	16400	35	<10	24	59	15	na	na	na	na	na	na
598	598-SG-01	3/17/99	13	<5	<100	<1	<1	1.3	<1	<1	na	na	na	na	na	na
			18	<5	1200	<1	<1	1.0	<1	<1	na	na	na	na	na	na
	598-SG-01-SPL			<0.65	na	<0.14	<0.20	<0.17	<0.20	<0.20	<0.34	<5.9	<1.4	ND	ND	ND
598	598-SG-02	3/17/99	13	250	38000	27	1.3	5.0	<1	<1	na	na	na	na	na	na
	598-SG-02-SPL			<3.6	na	<0.79	<1.1	<0.93	<1.1	<1.1	<1.9	<32	<7.5	ND	ND	ND
	598-SG-02		17	490 J	71000	54 J	<1 UJ	8.5 J	1.2 J	<1 UJ	na	na	na	na	na	na
598	598-SG-03	3/17/99	8	<5	390	<1	<1	2.5	<1	<1	na	na	na	na	na	na
			14	110 J	19000	14 J	<1	4.3 J	<1	<1	na	na	na	na	na	na
			17	520	55000	54	<1	10.0	1.6	<1	na	na	na	na	na	na
598	598-SG-04	3/18/99	9	<5	<100	<1	<1	<1	<1	<1	na	na	na	na	na	na
			14	<5	<100	<1	<1	1.2	<1	<1	na	na	na	na	na	na
			17	<5	110	<1	<1	1.2	<1	<1	na	na	na	na	na	na

Notes:

All regular and field duplicate samples were analyzed by InterPhase in their mobile lab at the site. All split samples were analyzed by Air Toxics, Ltd at their Folsom, CA facility.

-DUP = A field duplicate soil gas sample analyzed by InterPhase
-SPL = A split soil gas sample analyzed by Air Toxics Ltd.
ND = Not detected - no associated reporting limit was reported
na = Not analyzed

Data Qualifiers (for all samples)
U =Not detected
UJ = Not detected at the estimated reporting limit shown (based on evaluation of quality control)

InterPhase Specific Data Qualifiers
J = Estimated value (based on evaluation of quality control)
E = Exceeds the calibration range
I = Interference by the sample matrix

Air Toxics Specific Data Qualifiers
J = Estimated value - Compounds detected between the detection limit and the low point on the curve are "J" flagged.

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
65	065-BH-01-7.5-8.0 SV	7.5	8	19	<5	<1			
	065-BH-01-11.0-11.5 SV	11	11.5	38	9.4	<1			
	065-BH-01-17.0-17.5 SV	17	17.5	14	<5	<1			
	065-BH-01-25.5-26.0 SV	25.5	26	<5	<5	<1			
	065-BH-01-57.0-67.0 WV	57	67				<0.5	<0.5	<0.05
65	065-BH-02-7.5-8.0 SD	7.5	8	15	<5	<1			
	065-BH-02-10.0-10.5 SD	10	10.5	49	9.9	<1			
	065-BH-02-19.0-19.5 SD	19	19.5	5.1	<5	<1			
	065-BH-02-40.5-41.0 SD	40.5	41	<5	<5	<1			
	065-BH-02-70.5-72.5 WD	70.5	72.5				<0.5	<0.5	<0.05
65	065-BH-03-5.5-6.0 SV	5.5	6	<5	<5	<1			
	065-BH-03-11.0-11.5 SV	11	11.5	<5	<5	<1			
	065-BH-03-19.0-19.5 SV	19	19.5	6.2	<5	<1			
65	065-BH-04-5.5-6.0 SP	5.5	6	<5	<5	<1			
	065-BH-04-10.5-11.0 SP	10.5	11	<5	<5	<1			
	065-BH-04-16.5-17.0 SP	16.5	17	<5	<5	<1			
	065-BH-04-63.0-73.0 WP	63	73				<0.5	<0.5	<0.05
	065-BH-04-63.0-73.0 WP-D	63	73				<0.5	<0.5	<0.05
65	065-BH-05-6.0-6.5 SD	6	6.5	<5	<5	<1			
	065-BH-05-11.0-11.5 SD	11	11.5	<5	<5	<1			
	065-BH-05-20.0-20.5 SD	20	20.5	<5	<5	<1			
71	071-BH-01-12.0-SV	11.5	12	<5	<5	<1			
	071-BH-01-20.5-SV	20	20.5	<5	<5	<1			
71	071-BH-02-7.5-8.0 SU	7.5	8	<5	<5	<1			
	071-BH-02-18.5-19.0 SU	18.5	19	<5	<5	<1			
	071-BH-02-23.5-24.0 SU	23.5	24	<5	<5	<1			
71	071-BH-04-62.0-65.0 WO	62	65				<0.5	<0.5	<0.05
71	071-BH-05-24.0-24.5-SU	24	24.5	<5	<5	<1			
	071-BH-05-28.5-29.0-SU	28.5	29	<5	<5	<1			
	071-BH-05-60.0-62.0 WV	60	62				<0.5	<0.5	<0.05
	071-BH-05-60.0-62.0 WV-D	60	62				<0.5	<0.5	<0.05
73	073-BH-01-7.5-8.0-SD	7.5	8	<5	<5	<1			
	073-BH-01-11.0-11.5-SD	11	11.5	<5	<5	<1			
	073-BH-01-23.0-23.5-SD	23	23.5	<5	<5	<1			
	073-BH-01-60.0-70.0-WD	60	70				6,300	<20	<5
	073-BH-01-60.0-70.0-WD-D	60	70				6,700	<20	<5
73	073-BH-02-7.0-7.5-SV	7	7.5	<5	<5	<1			
	073-BH-02-11.0-11.5-SV	11	11.5	11	<5	<1			
	073-BH-02-22.0-22.5-SV	22	22.5	<5	<5	<1			

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
73	073-BH-03-7.5-SD	7.5	7.5	11	<5	<1			
	073-BH-03-15.5-SD	15.5	15.5	<5	<5	<1			
	073-BH-03-19.5-SD	19.5	19.5	<5	<5	<1			
73	073-BH-04-9.5-SD	9.5	9.5	<5	<5	<1			
	073-BH-04-16.0-SD	16	16	<5	<5	<1			
	073-BH-04-25.0-SD	25	25	6.9	<5	<1			
	073-BH-04-67-WD	67	67				9.2	0.51	<0.05
145	145-BH-01-5.5-SV	5	5.5	<5	<5	<1			
	145-BH-01-8.0-SV	7.5	8	<5	<5	<1			
	145-BH-01-19.0-WV	19	19				<0.5	<0.5	<0.05
	145-BH-01-19.0-WVD	19	19				<0.5	<0.5	<0.05
145	145-BH-02-6.0-SV	5.5	6	<5	<5	<1			
	145-BH-02-9.5-SV	9	9.5	<5	<5	<1			
	145-BH-02-19.0-WV	19	19				<0.5	<0.5	<0.05
145	145-BH-03-4.0-SV	3.5	4	<5	<5	<1			
	145-BH-03-8.0-SV	7.5	8	<5	<5	<1			
	145-BH-03-9.0-WV	9	9	<0.5	<0.5	<0.05			
153	153-BH-01-7.0-7.5 SO	7	7.5	<5	<5	<1			
	153-BH-01-12.0-12.5 SO	12	12.5	<5	<5	<1			
	153-BH-01-36.5-37.0 SO	36.5	37	<5	<5	<1			
	153-BH-01-37.0-37.5 WO	37	37.5				<0.5	<0.5	<0.05
153	153-BH-02-10.0-10.5 SD	10	10.5	<5	<5	<1			
	153-BH-02-13.5-14.0 SD	13.5	14	<5	<5	<1			
x	153-BH-02-34.0-34.5 SD	34	34.5	<5	<5	<1			
x	153-BH-02-37.0-37.5 WD	37	37.5				<0.5	<0.5	<0.05
	153-BH-02-37.0-37.5 WD-D	37	37.5				<0.5	<0.5	<0.05
153	153-BH-03-11.5-12.0 SO	11.5	12	<5	<5	<1			
	153-BH-03-21.0-21.5 SO	21	21.5	8.3	<5	<1			
x	153-BH-03-26.5-27.0 SO	26.5	27	<5	<5	<1			
x	153-BH-03-30.0-40.0 WO	30	40				<0.5	<0.5	<0.05
153	153-BH-04-8.5-9.0 SD	8.5	9	<5	<5	<1			
	153-BH-04-13.5-14.0 SD	13.5	14	<5	<5	<1			
x	153-BH-04-28.0-28.5 SD	28	28.5	<5	<5	<1			
x	153-BH-04-27.0-37.0 WD	27	37				<0.5	<0.5	<0.05
196	196-BH-01-14.5 SV	14	14.5	9.1	<5	<1			
	196-BH-01-18.5 SV	18	18.5	<5	<5	<1			
	196-BH-01-25.5-SV	25	25.5	<5	<5	<1			
	196-BH-01-31.5 WV	31.5	31.5				<0.5	<0.5	<0.05
	196-BH-01-31.5-WVD	31.5	31.5				<0.5	<0.5	<0.05

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
196	196-BH-02-10.0-SV	9.5	10	<5	<5	<1			
	196-BH-02-14.5-SV	14	14.5	41	<5	<1			
	196-BH-02-25.5 SV	25	25.5	<5	<5	<1			
	196-BH-02-31.5-WV	31.5	31.5				1.5	<0.5	<0.05
196	196-BH-03-6.5-SV	6	6.5	130	<5	<1			
	196-BH-03-11.5-SV	11	11.5	<5	<5	<1			
	196-BH-03-16.0-SV	15.5	16	<5	<5	<1			
	196-BH-03-36.0-WV	36	36				6.6	<0.5	<0.05
196	196-BH-04-6.5-SV	6	6.5	600	<5	<1			
	196-BH-04-11.0-SV	10.5	11	12	<5	<1			
	196-BH-04-16.5-SV	16	16.5	76	<5	<1			
	196-BH-04-35.0-WV	35	35				8.5	<0.5	<0.05
196	196-BH-05-6.5-SV	6	6.5	<5	<5	<1			
	196-BH-05-11.5-SV	11	11.5	<5	<5	<1			
	196-BH-05-16.5 SV	16	16.5	800	<5	<1			
	196-BH-05-35.0-WV	35	35				1.8	<0.5	<0.05
261	261-BH-01-7.5-SP	7.5	7.5	500	<5	<1			
	261-BH-01-15-SP	15	15	15000	<40	<10			
xx	**261-BH-01-19-SP**	**19**	**19**	**9,100**	**<20**	**<5**			
xx	**261-BH-01-22-WP**	**22**	**22**				**200,000**	**0.6**	**<130**
261	261-BH-02-7.5-SP	7.5	7.5	5200	<8	<2			
	261-BH-02-15-SP	15	15	660	9.2	1.5			
xx	**261-BH-02-19-SP**	**19**	**19**	**1,500**	**<5**	**<1**			
xx	**261-BH-02-22-WP**	**22**	**22**				**19,000**	**1.1**	**<5**
261	261-BH-03-7.5-SP	7.5	7.5	6000	<20	<5			
	261-BH-03-15-SP	15	15	5900	<20	31			
xx	**261-BH-03-19-SP**	**19**	**19**	**1,600**	**<5**	**<1**			
xx	**261-BH-03-22-WP**	**22**	**22**				**16,000**	**1.3**	**<13**
261	261-BH-04-5.5-SP	5.5	5.5	41	13	1.7			
	261-BH-04-12.5-SP	12.5	12.5	15	<5	<1			
xx	**261-BH-04-22-SP**	**22**	**22**	**74**	**10**	**1.3**			
xx	**261-BH-04-22-WP**	**22**	**22**				**5,400**	**<50**	**<13**
	261-BH-04-56-WP	56	56				3	<0.5	<0.05
261	261-BH-05-7.5-SO	7.5	7.5	55	<5	<1			
	261-BH-05-15.0-SO	15	15	39	<5	<1			
xx	**261-BH-05-19.5-SO**	**19.5**	**19.5**	**34**	**<5**	**<1**			
xx	**261-BH-05-22.0-WO**	**22**	**22**				**190**	**<1**	**<0.25**
	261-BH-05-22.0-WO-D	22	22				200	<1	<0.25

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
261	261-BH-06-7.5-SD	7.5	7.5	68	<5	<1			
	261-BH-06-15.0-SD	15	15	220	<5	<1			
xx	**261-BH-06-19.5-SD**	**19.5**	**19.5**	**<5**	**<5**	**<1**			
xx	**261-BH-06-22.0-WD**	**22**	**22**				**110**	**<0.5**	**<0.05**
287	287-BH-01-6.5-SO	6	6.5	<5	25	49			
	287-BH-01-19.0 SO	18.5	19	<5	<5	<1			
	287-BH-01-91.0 WO	91	91				<0.5	1.5	<0.05
	287-BH-01-91.0 WOD	91	91				<0.5	1.4	<0.05
287	287-BH-02-16.5-17.0SV	16.5	17	<5	<5	<1			
	287-BH-02-23.5-24.0 SV	23.5	24	<5	<5	<1			
	287-BH-02-43.5-44.0 SV	43.5	44	<5	<5	<1			
	287-BH-02-86.0-91.0 WV	86	91				800	11	<0.5
287	287-BH-03-6.0-6.5-SD	6	6.5	<5	<5	<1			
	287-BH-03-10.5-11.0SD	10.5	11	<5	<5	<1			
	287-BH-03-19.0-19.5SD	19	19.5	<5	<5	<1			
289	289-BH-01-7.5-8.0 SU	7.5	8	<5	<5	<1			
	289-BH-01-13.0-13.5 SU	13	13.5	<5	<5	<1			
	289-BH-01-21.5-22.0 SU	21.5	22	<5	<5	<1			
	289-BH-01-29.0-39.0 WU	29	39				<0.5	<0.5	<0.05
289	289-BH-02-7.0-7.5 SU	7	7.5	<5	<5	<1			
	289-BH-02-12.5-13.0 SU	12.5	13	<5	<5	<1			
x	289-BH-02-28.0-28.5 SU	28	28.5	<5	<5	<1			
x	289-BH-02-27.0-37.0 WU	27	37				<0.5	<0.5	<0.05
	289-BH-02-27.0-37.0 WU-D	27	37				<0.5	<0.5	<0.05
289	289-BH-03-11.5-12.0 SU	11.5	12	<5	<5	<1			
	289-BH-03-19.0-19.5 SU	19	19.5	<5	<5	<1			
	289-BH-03-36.5-37.0 SU	36.5	37	<5	<5	<1			
	289-BH-03-33.0-43.0 WU	33	43				<0.5	<0.5	<0.05
289	289-BH-04-7.0-7.3 SU	7	7.3	<5	<5	<1			
	289-BH-04-13.0-13.5 SU	13	13.5	<5	<5	<1			
	289-BH-04-22.0-22.5 SU	22	22.5	<5	<5	<1			
	289-BH-04-37.5-42.5 WU	37.5	42.5				<0.5	<0.5	<0.05
289	289-BH-05-7.5-8.0 SD	7.5	8	<5	<5	<1			
	289-BH-05-13.0-13.5 SD	13	13.5	<5	<5	<1			
	289-BH-05-22.0-22.5 SD	22	22.5	<5	<5	<1			
	289-BH-05-38.0-43.0 WD	38	43				<0.5	<0.5	<0.05
289	289-BH-06-6.0-6.5 SD	6	6.5	<5	<5	<1			
	289-BH-06-12.0-12.5 SD	12	12.5	<5	<5	<1			
	289-BH-06-21.5-22.0 SD	21.5	22	<5	<5	<1			
	289-BH-06-50.0-52.0 WD	50	52				<0.5	<0.5	<0.05

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
332	332-BH-01-6.5-7-SU	6.5	7	<5	<5	<1			
	332-BH-01-16.5-17-SU	16.5	17	<5	<5	<1			
	332-BH-01-27.5-28.0-S-U	27.5	28	<5	<5	<1			
	332-BH-01-34.5-40.0-W-U	34.5	40				3.3	<0.5	<0.05
	332-BH-01-34.5-40.0-W-U-X	34.5	40				3.6	<0.5	<0.05
332	332-BH-02-10.5-11.0-SD	10.5	11	<5	<5	<1			
	332-BH-02-16.5-17.0-SD	16.5	17	<5	<5	<1			
xx	**332-BH-02-35-35.5-SD**	**35**	**35.5**	**<5**	**<5**	**<1**			
xx	**332-BH-02-33-40-W-D**	**33**	**40**				**2,900**	**<1**	**0.53**
332	332-BH-03-6-6.5-SD	6	6.5	<5	<5	<1			
	332-BH-03-15.5-16.0-SD	15.5	16	<5	<5	<1			
xx	**332-BH-03-35.5-36-SD**	**35.5**	**36**	**<5**	**<5**	**<1**			
xx	**332-BH-03-34.0-36.5-W-D**	**34**	**36.5**				**5**	**<0.5**	**<0.05**
	332-BH-03-34.0-36.5-W-D-D	34	36.5				5	<0.5	<0.05
332	332-BH-04-16.0-16.5-S-U	16	16.5	370	<5	<1			
	332-BH-04-28.0-28.5-S-U	28	28.5	1,800	<5	<1			
	332-BH-04-35.0-36.0-W-U	35	36				26,000	<10	4.6
	332-BH-04-36.0-36.5-S-U	36	36.5				880	<5	<1
332	332-BH-05-16.0-16.5-S-U	16	16.5	21	<5	<1			
	332-BH-05-23.0-23.5-S-U	23	23.5	220	<5	<1			
	332-BH-05-34.0-36.5-W-U	34	36.5				4900	<2	1.2
	332-BH-05-36.0-36.5-S-U	36	36.5				96	<5	<1
342	342-BH-01-6.5-SO	6	6.5	<5	<5	<1			
	342-BH-01-11.5-SO	11	11.5	<5	<5	<1			
	342-BH-01-20.0-25.0 WO	20	25				1.2	<0.5	<0.05
342	342-BH-02-6.0-SD	5.5	6	53	<5	<1			
	342-BH-02-11.0-SD	10.5	11	70	<5	<1			
	342-BH-02-20.0-25.0 WD	20	25				<0.5	<0.5	<0.05
	342-BH-02-20.0-25.0 WD-D	20	25				<0.5	<0.5	<0.05
342	342-BH-03-3.0-SD	2.5	3	28	<5	5.6			
	342-BH-03-5.5-SD	5	5.5	74	<5	<1			
	342-BH-03-10.5-SD	10	10.5	140	<5	<1			
	342-BH-03-20.0-25.0 WD	20	25				25	<0.5	<0.05
342	342-BH-04-6.0-SD	5.5	6	13	<5	<1			
	342-BH-04-11.0-SD	10.5	11	32	<5	<1			
	342-BH-04-25 WD	25	25				21	<0.5	<0.05
342	342-BH-05-6.5-SO	6	6.5	<5	<5	<1			
	342-BH-05-11.5-SO	11	11.5	78	<5	<1			
	342-BH-05-25-WO	25	25				430	<1	<0.25

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
342	342-BH-06-6.0-SV	5.5	6	<5	<5	<1			
	342-BH-06-11.5-SV	11	11.5	<5	<5	<1			
	342-MW-01-990201	12	12	1,700	3.6	<0.5			
	342-BH-06-25-WV	25	25				<0.5	<0.5	<0.05
405	405-BH-01-8.0-8.5SD	8	8.5	<5	<5	<1			
	405-BH-01-13.5-14.0 SD	13.5	14	<5	<5	<1			
	405-BH-01-18.0-18.5 SD	18	18.5	<5	<5	<1			
	405-BH-01-33.5-43.5WD	33.5	43.5				<0.5	<0.5	<0.05
405	405-BH-02-13.5-14.0 SV	13.5	14	<5	<5	<1			
	405-BH-02-20.5-21.5SV	20.5	21.5	<5	<5	<1			
	405-BH-02-39.0-39.5 SV	39	39.5	<5	<5	<1			
	405-BH-02-47.0-52.0 WV	47	52				<0.5	<0.5	<0.05
	405-BH-02-47.0-52.0WV-D	47	52				<0.5	<0.5	<0.05
405	405-BH-03-11.0-11.5 SV	11	11.5	<5	<5	<1			
	405-BH-03-20.5-21.0 SV	20.5	21	<5	<5	<1			
	405-BH-03-35.5-36.0 SV	35.5	36	<5	<5	<1			
	405-BH-03-50.0-55.0 WV	50	55				<0.5	<0.5	<0.05
405	405-BH-04-10.5-11.0 SD	10.5	11	<5	<5	<1			
	405-BH-04-20.5-21.0 SD	20.5	21	<5	<5	<1			
	405-BH-04-25.5-26.0 SD	25.5	26	<5	<5	<1			
	405-BH-04-50.0-55.0 WD	50	55				<0.5	<0.5	<0.05
422	422-BH-01-7.5-8-SU	7.5	8	<5	<5	<1			
x	422-BH-01-18.5-19-SU	18.5	19	<5	<5	<1			
x	422-BH-01-18.5-20-W-U	18.5	20				<0.5	<0.5	<0.05
422	422-BH-02-14.5-15 SU	14.5	15	<5	<5	<1			
x	422-BH-02-17-17.5 SU	17	17.5	<5	<5	<1			
x	422-BH-02-18.7-20.0-W-U	18.7	20				<0.5	<0.5	<0.05
	422-BH-02-18.7-20.0-W-U-D	18.7	20				<0.5	<0.5	<0.05
422	422-BH-03-5.5-6 SD	5.5	6	<5	<5	<1			
	422-BH-03-13.5-14 SD	13.5	14	<5	<5	<1			
	422-BH-02-18-18.5 SU	18	18.5	<5	<5	<1			
x	422-BH-03-19.5-20 SD	19.5	20	<5	<5	<1			
x	422-BH-03-18.5-20-W-D	18.5	20				<0.5	<0.5	<0.05
422	422-BH-04-5.5-6 SD	5.5	6	<5	<5	<1			
	422-BH-04-16-16.5 SD	16	16.5	<5	<5	<1			
x	422-BH-04-19.5-20 SD	19.5	20	<5	<5	<1			
x	422-BH-04-18.0-20.0-W-D	18	20				<0.5	<0.5	<0.05

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
422	422-BH-05-6-6.5 SD	6	6.5	<5	<5	<1			
	422-BH-05-15-15.5 SD	15	15.5	<5	<5	<1			
x	422-BH-05-17.5-18 SD	17.5	18	<5	<5	<1			
x	422-BH-05-18.0-20.0-W-D	18	20				<0.5	<0.5	<0.05
437	437-BH-01-6.0 S0	5.5	6	<5	<5	<1			
	437-BH-01-11.0 SO	10.5	11	<5	<5	<1			
	437-BH-01-25.0 WO	25	25				<0.5	<0.5	<0.05
437	437-BH-02-10.5 SD	10	10.5	<5	<5	<1			
	437-BH-02-15.0 SD	14.5	15	<5	<5	<1			
	437-BH-02-28.0 WD	28	28				<0.5	<0.5	<0.05
437	437-BH-03-11.0 SV	10.5	11	<5	<5	<1			
	437-BH-03-15.5 SV	15	15.5	<5	<5	<1			
	437-BH-03-25.0 WV	25	25				<0.5	<0.5	<0.05
	437-BH-03-25.0 WVD	25	25				<0.5	<0.5	<0.05
437	437-BH-04-6.5 SV	6	6.5	<5	<5	<1			
	437-BH-04-11.0 SV	10.5	11	<5	<5	<1			
	437-BH-04-25.0 WV	25	25				<0.5	<0.5	<0.05
437	437-BH-05-6.5 SV	6	6.5	<5	<5	<1			
	437-BH-05-12.5 SV	12	12.5	<5	<5	13			
	437-BH-05-25.0 WV	25	25				19	<0.5	<0.05
437	437-BH-06-14.0 SO	13.5	14	<5	<5	<1			
	437-BH-06-5.5 SO	5	5.5	<5	<5	<1			
	437-BH-06-31.0 WV	31	31				8.1	<0.5	<0.05
470	470-BH-01-7.5-SV	7.5	7.5	<5	<5	<1			
	470-BH-01-13.5-SV	13.5	13.5	<5	<5	<1			
	470-BH-01-22.0-SV	22	22	<5	<5	<1			
	470-BH-01-28.0-WV	28	28				<0.5	<0.5	<0.05
	470-BH-01-28.0-WV-D	28	28				<0.5	<0.5	<0.05
470	470-BH-02-7.5-SV	7.5	7.5	<5	<5	<1			
	470-BH-02-14.0-SV	14	14	<5	<5	<1			
	470-BH-02-21.5-SV	21.5	21.5	<5	<5	<1			
	470-BH-02-28.0.WV	28	28				<0.5	<0.5	<0.05
470	470-BH-03-8.5-SP	8.5	8.5	<5	<5	<1			
	470-BH-03-17.0-SP	17	17	<5	<5	<1			
	470-BH-03-22.0-SP	22	22	<5	<5	<1			
	470-BH-03-28-WP	28	28				<0.5	<0.5	<0.05
	470-BH-03-37-WP	37	37				<0.5	<0.5	<0.05
470	470-BH-04-7.5-SD	7.5	7.5	<5	<5	<1			
	470-BH-04-16.5-SD	16.5	16.5	<5	<5	<1			
	470-BH-04-33.0-WD	33	33				<0.5	<0.5	<0.05

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	**Field Samp ID**	**Beginning Depth**	**Ending Depth**	**MTBE (ug/kg)**	**Benzene (ug/kg)**	**TPH as Gasoline (mg/kg)**	**MTBE (ug/L)**	**Benzene (ug/L)**	**TPH as Gasoline (mg/L)**
470	470-BH-05-9.5-SD	9.5	9.5	<5	<5	<1			
	470-BH-05-15.0-SD	15	15	<5	<5	<1			
	470-BH-05-24.0-SD	24	24	<5	<5	<1			
	470-BH-05-29-WD	29	29				<0.5	<0.5	<0.05
489	489-BH-01-8.5-9.0-SD	8.5	9	<5	<5	<1			
	489-BH-01-25.5-26-SD	25.5	26	<5	<5	<1			
x	489-BH-01-45.5-46-SD	45.5	46	<5	<5	<1			
x	489-BH-01-42.0-45.0-W-D	42	45				<0.5	<0.5	<0.05
489	489-BH-02-15-15.5 SU	15	15.5	<5	<5	<1			
	489-BH-02-26.5-27 SU	26.5	27	<5	<5	<1			
	489-BH-02-44-52-WU	44	52				1.9	<0.5	<0.05
489	489-BH-03-12.5-13 SU	12.5	13	<5	<5	<1			
	489-BH-03-21.5-22 SU	21.5	22	<5	<5	<1			
	489-BH-03-30.5-31 SU	30.5	31	<5	<5	<1			
	489-BH-03-42-45-W-U	42	45				<0.5	<0.5	<0.05
489	489-BH-04-15.5-16-SU	15.5	16	<5	<5	<1			
	489-BH-04-21.5-22-SU	21.5	22	<5	<5	<1			
	489-BH-04-33.5-34-SU	33.5	34	<5	<5	<1			
	489-BH-04-43.0-49.0-W-U	43	49				<0.5	<0.5	<0.05
	489-BH-04-43.0-49.0-W-U-D	43	49				<0.5	<0.5	<0.05
489	489-BH-05-16-16.5-SU	16	16.5	<5	<5	<1			
	489-BH-05-35.5-36-SU	35.5	36	<5	<5	<1			
x	489-BH-05-45.5-46-SU	45.5	46	<5	<5	<1			
x	489-BH-05-42.0-45.0-WU	42	45				<0.5	<0.5	<0.05
490	490-BH-01-5.5-6.0 SV	5.5	6	<5	<5	<1			
	490-BH-01-10.0-10.5 SV	10	10.5	<5	<5	<1			
x	490-BH-01-14.0-14.5 SV	14	14.5	<5	<5	<1			
x	490-BH-01-14.0-24.0 WV	14	24				<0.5	<0.5	<0.05
490	490-BH-02-5.5-6.0 SV	5.5	6	<5	<5	<1			
	490-BH-02-11.0-11.5 SV	11	11.5	<5	<5	<1			
x	490-BH-02-14.0-14.5 SV	14	14.5	<5	<5	<1			
x	490-BH-02-14.0-19.0 WV	14	19				<0.5	<0.5	<0.05
	490-BH-02-22.0-24.0 WV	22	24				<0.5	<0.5	<0.05
	490-BH-02-22.0-24.0 WV-D	22	24				<0.5	<0.5	<0.05
	490-BH-02-28.0-30.0 WV	28	30				<0.5	<0.5	<0.05
490	490-BH-03-5.5-6.0 SP	5.5	6	<5	<5	<1			
	490-BH-03-11.0-11.5 SP	11	11.5	<5	<5	<1			
x	490-BH-03-14.0-14.5 SP	14	14.5	<5	<5	<1			
x	490-BH-03-14.0-19.0 WP	14	19				<0.5	<0.5	<0.05

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
490	490-BH-04-6.0-6.5 SD	6	6.5	<5	<5	<1			
x	490-BH-04-13.5-14.0 SD	13.5	14	<5	<5	<1			
x	490-BH-04-14.0-19.0 WD	14	19				<0.5	<0.5	<0.05
490	490-BH-05-5.0-5.5 SD	5	5.5	<5	<5	<1			
	490-BH-05-10.5-11.0 SD	10.5	11	<5	<5	<1			
x	490-BH-05-14.0-14.5 SD	14	14.5	<5	<5	<1			
x	490-BH-05-14.0-19.0 WD	14	19				<0.5	<0.5	<0.05
490	490-BH-06-5.5-6.0 SD	5.5	6	<5	<5	<1			
	490-BH-06-11.0-11.5 SD	11	11.5	<5	<5	1			
x	490-BH-06-16.0-16.5 SD	16	16.5	<5	<5	<1			
x	490-BH-06-14.0-19.0 WD	14	19				<0.5	<0.5	<0.05
	490-BH-06-22.0-24.0 WD	22	24				<0.5	<0.5	<0.05
	490-BH-06-28.0-30.0 WD	28	30				<0.5	<0.5	<0.05
505	505-BH-01-6.0-SD	6	6	<5	<5	<1			
	505-BH-01-12.0-SD	12	12	2400	<5	<1			
xx	**505-BH-01-23.5-SD**	**23.5**	**23.5**	**1,800**	**<5**	**<1**			
xx	**505-BH-01-25.0-WD**	**25**	**25**				**25,000**	**<50**	**<13**
505	505-BH-02-6.0-6.5 SP	6	6.5	340	<5	<1			
	505-BH-02-13.0-13.5 SP	13	13.5	970	<5	<1			
xx	**505-BH-02-23.0-23.5 SP**	**23**	**23.5**	**15**	**<5**	**<1**			
xx	**505-BH-02-20.0-25.0 WP**	**20**	**25**				**220**	**<10**	**<2.5**
	505-BH-02-39.7-40.0 WP	39.7	40				9.3	<0.5	<0.05
	505-BH-02-39.7-40.0 WP-D	39.7	40				8.8	<0.5	<0.05
505	505-BH-03-5.5-SV	5.5	5.5	37	<5	<1			
	505-BH-03-13.0-SV	13	13	18	<5	<1			
xx	**505-BH-03-22.0-SV**	**22**	**22**	**<5**	**<5**	**<1**			
xx	**505-BH-03-25.0-WV**	**25**	**25**				**3.7**	**<0.5**	**<0.05**
505	505-BH-04-6.0-SV	6	6	<5	<5	<1			
	505-BH-04-11.5-SV	11.5	11.5	<5	<5	<1			
	505-BH-04-19.0-SV	19	19	<5	<5	<1			
	505-BH-04-25.0-WV	25	25				0.57	<0.5	<0.05
505	505-BH-05-6.0-6.5 SD	6	6.5	67	<5	<1			
	505-BH-05-12.0-12.5 SD	12	12.5	1,400	<5	<1			
xx	**505-BH-05-22.0-22.5 SD**	**22**	**22.5**	**12**	**<5**	**<1**			
xx	**505-BH-05-20.0-25.0 WD**	**20**	**25.5**				**280**	**<2**	**<0.5**
	505-BH-05-35.0-37.0 WD	35	37				620	<5	<1.3
505	505-BH-06-6.0-SO	6	6	<5	<5	<1			
	505-BH-06-11.5-SO	11.5	11.5	430	<5	<1			
	505-BH-06-20.0-SO	20	20	260	<5	<1			
	505-BH-06-25.0-WO	25	25				2,300	<20	<5

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
556	556-BH-01-12.0-12.5 SV	12	12.5	<5	<5	<1			
	556-BH-01-25.0-25.5 SV	25	25.5	<5	<5	<1			
	556-BH-01-28.0-28.5 SV	28	28.5	<5	<5	<1			
	556-BH-01-23.0-43.0-WV	23	43				<0.5	<0.5	<0.05
	556-BH-01-23.0-43.0-WV-D	23	43				<0.5	<0.5	<0.05
556	556-BH-02-12.0-12.5 SV	12	12.5	<5	<5	<1			
	556-BH-02-21.0-21.5 SV	21	21.5	<5	<5	<1			
	556-BH-02-28.0-28.5 SV	28	28.5	<5	<5	<1			
556	556-BH-03-7.0-7.5 SD	7	7.5	<5	<5	<1			
	556-BH-03-16.0-16.5 SD	16	16.5	<5	<5	<1			
	556-BH-03-28.5-29.0 SD	28.5	29	<5	<5	<1			
	556-BH-03-38.5-39.0 SD	38.5	39	<5	<5	<1			
	556-BH-03-20.0-40.0 WD	20	40				<0.5	<0.5	<0.05
556	556-BH-04-7.0-7.5 SD	7	7.5	<5	<5	<1			
	556-BH-04-10.5-11.0 SD	10.5	11	<5	<5	<1			
	556-BH-04-28.0-28.5 SD	28	28.5	<5	<5	<1			
	556-BH-04-23.0-43.0 WD	23	43				<0.5	<0.5	<0.05
556	556-BH-05-8.0-8.5 SD	8	8.5	<5	<5	<1			
	556-BH-05-23.0-23.5 SD	23	23.5	<5	<5	<1			
x	556-BH-05-28.5-29.0 SD	28.5	29	<5	<5	<1			
x	556-BH-05-32.0-52.0 WD	32	52				<0.5	<0.5	<0.05
571	571-BH-01-5.5-6.0 SV	5.5	6	<5	<5	<1			
	571-BH-01-11.0-11.5 SV	11	11.5	<5	<5	<1			
	571-BH-01-12.0-17.5 SV	17	17.5	8.1	<5	<1			
	571-BH-01-22.5-24.5 WV	22.5	24.5				<0.5	<0.5	<0.05
	571-BH-01-28.0-30.0 WV	28	30				<0.5	<0.5	<0.05
571	571-BH-02-5.5-6.0 SP	5.5	6	<5	<5	<1			
	571-BH-02-14.0-14.5 SP	14	14.5	<5	<5	<1			
	571-BH-02-23.0-25.0 WP	23	25				<0.5	<0.5	<0.05
571	571-BH-03-5.0-5.5 SD	5	5.5	<5	<5	<1			
	571-BH-03-10.0-10.5 SD	10	10.5	<5	<5	<1			
	571-BH-03-13.0-13.5 SD	13	13.5	<5	<5	<1			
	571-BH-03-19.5-21.5 WD	19.5	21.5				<0.5	<0.5	<0.05
571	571-BH-04-5.5-6.0 SO	5.5	6	<5	<5	<1			
	571-BH-04-11.0-11.5 SO	11	11.5	<5	<5	<1			
	571-BH-04-17.5-18.0 SO	17.5	18	<5	<5	<1			
	571-BH-04-23.0-25.0 WO	23	25				<0.5	<0.5	<0.05
571	571-BH-05-5.5-6.0 SD	5.5	6	<5	<5	<1			
	571-BH-05-10.0-10.5 SD	10	10.5	<5	<5	<1			
x	571-BH-05-13.0-13.5 SD	13	13.5	<5	<5	<1			
x	571-BH-05-16.5-18.5 WD	16.5	18.5				<0.5	<0.5	<0.05
	571-BH-05-16.5-18.5 WD-D	16.5	18.5				<0.5	<0.5	<0.05
571	571-BH-06-5.5-6.0 SD	5.5	6	<5	<5	<1			
	571-BH-06-10.0-10.5 SD	10	10.5	<5	<5	<1			

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
x	571-BH-06-13.0-13.5 SD	13	13.5	<5	<5	<1			
x	571-BH-06-16.5-18.5 WO	16.5	18.5				<0.5	<0.5	<0.05
571	571-BH-07-5.5-6.0 SV	5.5	6	<5	<5	<1			
	571-BH-07-10.5-11.0 SV	10.5	11	<5	<5	<1			
x	571-BH-07-13.5-14.0 SV	13.5	14	<5	<5	<1			
x	571-BH-07-17.0-19.0 WV	17	19				<0.5	<0.5	<0.05
586	586-BH-01-59.0-61.0 WD	59	61				<0.5	2	<0.05
	586-BH-01-59.0-61.0 WD-D	59	61				<0.5	1.5	<0.05
586	586-BH-02-7.0-7.5 SP	7	7.5	<5	<5	<1			
	586-BH-02-11.0-11.5 SP	11	11.5	<5	<5	<1			
	586-BH-02-23.5-24.0 SP	23.5	24	<5	<5	<1			
586	586-BH-03-5.0-5.5 SD	5	5.5	<5	<5	<1			
	586-BH-03-10.0-10.5 SD	10	10.5	<5	<5	<1			
	586-BH-03-25.0-25.5 SD	25	25.5	<5	<5	<1			
586	586-BH-04-10.0-10.5 SV	10	10.5	<5	<5	<1			
	586-BH-04-25.0-25.5 SV	25	25.5	<5	<5	<1			
	586-BH-04-5.0-5.5 SV	5	5.5	<5	<5	<1			
586	586-BH-05-13.5-14.0 SV	13.5	14	<5	<5	<1			
	586-BH-05-31.5-32.0 SV	31.5	32	6.9	<5	<1			
	586-BH-05-59.0-61.0 WV	59	61				<5	37	12
586	586-BH-06-7.0-7.5 SO	7	7.5	<5	<5	<1			
	586-BH-06-11.5-12.0 SO	11.5	12	<5	<5	<1			
	586-BH-06-22.5-23.0 SO	22.5	23	<5	<5	<1			
592	592-BH-01-10.5-11-SU	10.5	11	<5	<5	<1			
	592-BH-01-20.5-21-SU	20.5	21	<5	<5	<1			
	592-BH-01-27.5-28-SU	27.5	28	<5	<5	<1			
xx	**592-BH-01-33.5-34-SU**	**33.5**	**34**	**6.1**	**<5**	**<1**			
xx	**592-BH-01-36.3-37-W-U**	**36.3**	**37**				**6**	**<0.5**	**<0.05**
592	592-BH-02-13.5-14-SU	13.5	14	7.2	<5	<1			
	592-BH-02-22.5-23-SU	22.5	23	110	<5	<1			
	592-BH-02-29-29.5-SU	29	29.5	38	<5	<1			
	592-BH-02-38-38.5-SU	38	38.5	20	<5	<1			
	592-BH-02-30-43-W-U	30	43				19	<0.5	<0.05
592	592-BH-03-12.5-13.0-SD	12.5	13	<5	<5	<1			
	592-BH-03-24-24.5-SD	24	24.5	<5	<5	<1			
	592-BH-03-41-WD	41	41				<0.5	<0.5	<0.05
592	592-BH-04-10.5-11-SD	10.5	11	<5	<5	<1			
	592-BH-04-26-26.5-SD	26	26.5	<5	<5	<1			
	592-BH-04-41-WD	41	41				37	<0.5	<0.05
	592-BH-04-41-WD-D	41	41				40	<0.5	<0.05
593	593-BH-01-6.0-6.5 SP	6	6.5	<5	<5	<1			
	593-BH-01-13.0-13.5 SP	13	13.5	<5	<5	<1			
	593-BH-01-23.0-23.5 SP	23	23.5	<5	<5	<1			
	593-BH-01-35.5-36.0 SP	35.5	36	<5	<5	<1			

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
	593-BH-01-100.0-100.5 WP	100	100.5				<0.5	<0.5	<0.05
	593-BH-01-100.0-100.5 WP-D	100	100.5				<0.5	<0.5	<0.05
593	593-BH-02-13.5-14.0 SU	13.5	14	<5	<5	<1			
	593-BH-02-26.0-26.5 SU	26	26.5	<5	<5	<1			
	593-BH-02-36.0-36.5 SU	36	36.5	<5	<5	<1			
x	593-BH-02-91.0-91.5 SU	91	91.5	<5	<5	<1			
x	593-BH-02-93.0-100.0 WU	93	100				<0.5	<0.5	<0.05
594	594-BH-01-7.0-7.5 SD	7	7.5	<5	<5	<1			
	594-BH-01-15.0-15.5 SD	15	15.5	<5	<5	<1			
	594-BH-01-31.0-31.5 SD	31	31.5	<5	<5	<1			
	594-BH-01-59.0-61.0 WD-D	59	61				<0.5	<0.5	<0.05
	594-BH-01-59.1-61.0 WD	59	61				<0.5	<0.5	<0.05
594	594-BH-02-12.0-12.5 SD	12	12.5	<5	<5	<1			
	594-BH-02-24.5-25.0 SD	24.5	25	<5	<5	<1			
	594-BH-02-34.5-35.0 SD	34.5	35	<5	<5	<1			
	594-BH-02-53.0-55.0 WD	53	55				1.6	<0.5	<0.05
594	594-BH-03-11.0-11.5 SD	11	11.5	<5	6.3	<1			
	594-BH-03-15.5-16.0 SD	15.5	16	<5	<5	<1			
	594-BH-03-26.0-26.5 SD	26	26.5	<5	<5	<1			
	594-BH-03-44.5-45.0 SD	44.5	45	<200	5,700	1,300			
	594-BH-03-49.0-49.5 SD	49	49.5	18	72	1.9			
	594-BH-03-64.0-65.0 WD	64	65				0.55	1.4	0.08
595	595-BH-01-5.0-5.5 SP	5	5.5	<5	<5	<1			
	596-BH-01-10.0-10.5 SU	10	10.5	<5	<5	<1			
	595-BH-01-15.0-15.5 SP	15	15.5	<5	<5	<1			
	596-BH-01-17.0-17.5 SU	17	17.5	<5	<5	<1			
	595-BH-01-24.0-24.5 SP	24	24.5	<5	<5	<1			
	596-BH-01-32.0-32.5 SU	32	32.5	<5	<5	<1			
x	595-BH-01-33.0-33.5 SP	33	33.5	<5	<5	<1			
x	596-BH-01-32.0-37.0 WU	32	37				<0.5	<0.5	<0.05
596	596-BH-02-7.5-8.0 SD	7.5	8	<5	<5	<1			
	596-BH-02-19.0-19.5 SD	19	19.5	<5	<5	<1			
x	596-BH-02-27.0-27.5 SD	27	27.5	<5	<5	<1			
x	596-BH-02-30.0-35.0 WD	30	35.5				<0.5	<0.5	<0.05
596	596-BH-03-10.5-11.0 SO	10.5	11	10	<5	<1			
	596-BH-03-20.5-21.0 SO	20.5	21	<5	<5	<1			
	596-BH-03-25.5-26.0 SO	25.5	26	<5	<5	<1			
	596-BH-03-33.0-35.0 WO	33	35				<0.5	<0.5	<0.05
596	596-BH-04-12.0-12.5 SV	12	12.5	<5	<5	<1			
	596-BH-04-15.0-15.5 SV	15	15.5	<5	<5	<1			
	596-BH-04-18.0-18.5 SV	18	18.5	<5	<5	<1			
	596-BH-04-27.5-28.0 SV	27.5	28	<5	<5	<1			
	596-BH-04-34.0-35.0 WV	34	35				<0.5	<0.5	<0.05
597	597-BH-01-10.0-10.5 SU	10	10.5	<5	<5	<1			

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

ID	Field Samp ID	Beginning Depth	Ending Depth	Soil			Groundwater		
				MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
	597-BH-01-14.5-15.0 SU	14.5	15	<5	<5	<1			
xx	**597-BH-01-20.0-20.5 SU**	**20**	**20.5**	**<5**	**<5**	**<1**			
xx	**597-BH-01-21.5-25.0 WU**	**21.5**	**25**				**3.1**	**<0.5**	**<0.05**
597	597-BH-02-4-4.5 SU	4	4.5	<5	<5	<1			
	597-BH-02-9.5-10 SU	9.5	10	<5	<5	<1			
	597-BH-02-14.5-15 SU	14.5	15	<5	<5	<1			
xx	**597-BH-02-19.5-20 SU**	**19.5**	**20**	**<5**	**<5**	**<1**			
xx	**597-BH-02-8.0-20.0 WU**	**8**	**20**				**1.7**	**<0.5**	**<0.05**
	597-BH-02-8.0-20.0 WU-D	8	20				2.2	<0.5	<0.05
597	597-BH-03-5.0-5.5 SU	5	5.5	<5	<5	<1			
	597-BH-03-10.0-10.5 SU	10	10.5	<5	<5	<1			
xx	**597-BH-03-16.0-16.5 SU**	**16**	**16.5**	**<5**	**<5**	**<1**			
xx	**597-BH-03-13.0-20.0 WU**	**13**	**20**				**2.6**	**<0.5**	**<0.05**
597	597-BH-04-8-8.5-SD	8	8.5	<5	<5	<1			
xx	597-BH-04-15-15.5-SD	15	15.5	8.4	<5	<1			
	597-BH-04-18-18.5-SD	18	18.5	<5	<5	<1			
	597-BH-04-24.5-25-SD	**24.5**	**25**	**<5**	**<5**	**<1**			
xx	**597-BH-04-9.5-25-W-D**	**9.5**	**25**				**27**	**<0.5**	**<0.05**
	597-BH-04-9.5-25-W-D-X	9.5	25				26	<0.5	<0.05
597	597-BH-05-2-2.5-SD	2	2.5	<5	<5	<1			
	597-BH-05-14.515.0-SD	14.5	15	<5	<5	<1			
x	597-BH-05-26.5-27-SD	26.5	27	<5	<5	<1			
x	597-BH-05-15-28-W-D	15	28				<0.5	<0.5	<0.05
597	597-BH-06-5-5.5-SD	5	5.5	<5	<5	<1			
	597-BH-06-12-12.5-SD	12	12.5	<5	<5	<1			
x	597-BH-06-17.5-18-SD	17.5	18	<5	<5	<1			
x	597-BH-06-17-22-W-D	17	22				<0.5	<0.5	<0.05
598	598-BH-01-10.5-11.0 SV	10.5	11	<5	<5	<1			
	598-BH-01-14.5-15.0 SV	14.5	15	<5	<5	<1			
x	598-BH-01-19.5-20.0 SV	19.5	20	<5	<5	<1			
x	598-BH-01-17.5-27.5 WV	17.5	27.5				<0.5	<0.5	<0.05
	598-BH-01-17.5-27.5 WV-D	17.5	27.5				<0.5	<0.5	<0.05
598	598-BH-02-11.0-11.5 SV	11	11.5	<5	<5	<1			
	598-BH-02-16.0-16.5 SV	16	16.5	<5	<5	<1			
xx	**598-BH-02-19.0-19.5 SV**	**19**	**19.5**	**41**	**<5**	**<1**			
xx	**598-BH-02-18.0-28.0 WV**	**18**	**28**				**3.5**	**<0.5**	**<0.05**
598	598-BH-03-7.0-7.5 SD	7	7.5	<5	<5	<1			
	598-BH-03-13.5-14.0 SD	13.5	14	<5	<5	<1			
x	598-BH-03-19.5-20.0 SD	19.5	20	<5	<5	<1			
x	598-BH-03-15.0-25.0 WD	15	25				<0.5	<0.5	<0.05
598	598-BH-04-5.5-6.0 SD	5.5	6	<5	<5	<1			
	598-BH-04-12.5-13.0 SD	12.5	13	<5	<5	<1			
xx	**598-BH-04-17.5-18.0 SD**	**17.5**	**18**	**<5**	**<5**	**<1**			
xx	**598-BH-04-12.0-22.0 WD**	**12**	**22**				**280**	**2.8**	**0.38**

Soil and Groundwater Correlations

Investigation of MtBE Occurrence Associated with Operating UST Systems

				Soil			Groundwater		
ID	Field Samp ID	Beginning Depth	Ending Depth	MTBE (ug/kg)	Benzene (ug/kg)	TPH as Gasoline (mg/kg)	MTBE (ug/L)	Benzene (ug/L)	TPH as Gasoline (mg/L)
598	598-BH-05-6.0-6.5 SD	6	6.5	<5	<5	<1			
	598-BH-05-14.0-14.5 SD	14	14.5	<5	<5	<1			
xx	**598-BH-05-19.0-19.5 SD**	**19**	**19.5**	**<5**	**<5**	**<1**			
xx	**598-BH-05-12.0-22.0 WD**	**12**	**22**				**46**	**<0.5**	**0.051**
598	598-BH-06-5.0-5.5 SP	5	5.5	260	<32	95			
	598-BH-06-11.5-12.0 SP	11.5	12	<5	<5	<1			
x	598-BH-06-19.0-19.5 SP	19	19.5	<5	<5	<1			
x	598-BH-06-15.0-25.0 WP	15	25				<0.5	<0.5	<0.05

x: correlation selected, ND in soil and groundwater

xx: correlation selected, value above dl in soil OR groundwater, used for scatter plot

Samples in bold font were used in correlation analysis between soil and groundwater samlples.

Summary of Physical Parameters for Soil Samples

Investigation of MtBE Occurrence Associated with Operating UST Systems

(units of measurement are as shown)

Site ID	Location	Depth (ft bgs)	Visual Description	Total Organic Carbon (percent)	Moisture Content (percent)	Wet Weight (lbs/cu.ft.)	Dry Unit Weight (lbs/cu.ft.)	Porosity (percent)
065	065-BH-01	13.0 - 13.5	Brown fine sandy silty clay	0.10	14.26	125.9	110.2	34.58
		23.0 - 23.5	Brown fine sandy silty clay with trace gravel	0.08	19.14	128.5	107.9	35.94
		34.5 - 35.0	Gray brown gravelly sand	0.06	6.13	143.8	135.5	19.56
073	073-BH-02	11.5 - 12.0	Brown fine sandy silty clay	0.20	22.88	125.5	102.1	39.39
		22.5 - 23.0	Brown fine sandy silty clay	0.09	21.97	123.1	100.9	40.10
	073-BH-03	43.0 - 43.5	Mottled gray brown fine sandy silty clay	0.06	19.14	121.4	101.9	39.51
	073-BH-04	15.5 - 16.0	Brown fine sandy silty clay	0.19	19.98	119.1	99.3	41.05
		19.0 - 19.5	Brown sandy clay with gravel	0.12	14.87	129.6	112.8	33.04
		58.0 - 58.5	Bluish gray gravelly clayey sand	0.06	4.70	NA	NA	NA
		63.0 - 63.5	Olive brown gravelly clayey sand	0.05	11.61	143.4	128.5	23.71
145	145-BH-01	9.0 - 9.5	Brown sandy silty clay/sandy clayey silt	0.03	24.77	129.4	103.7	38.44
		17.0 - 17.5	Brown silty sand	0.10	19.04	125.9	105.7	37.25
261	261-BH-05	6.0 - 6.5	Brown silty clay	0.18	18.31	130.3	110.1	34.64
		8.5 - 9.0	Brown silty clay	0.19	19.73	121.4	101.4	39.80
		19.0 - 19.5	Brown fine sandy silty clay	0.08	23.10	129.3	105.1	37.60
287	287-BH-01	12.5 - 13.0	Lt. brown silty sand (SP-SM)	0.01	2.59	103.6	101.0	40.04
		21.5 - 22.0	Brown fine sandy silty clay	0.17	20.16	118.7	98.4	41.58
		24.5 - 25.0	Brown fine sandy clay	0.15	23.00	122.6	99.7	40.81
		44.5 - 45.0	Brown fine sandy silty clay	0.04	19.00	140.6	118.2	29.83
289	289-BH-03	33.5 - 34.0	Gray clay	0.13	26.57	122.6	96.9	42.47
	289-BH-05	10.0 - 10.5	Grayish brown clay	0.14	30.32	115.6	88.7	47.34
342	342-BH-01	18.5 - 19.0	Brown fine sandy clay	0.23	21.95	133.4	109.4	35.05
	342-BH-02	15.5 - 16.0	Brown fine sandy clay	0.21	28.06	124.9	97.5	42.11
	342-BH-04	24.5 - 25.0	Brown clayey sand with gravel	0.13	11.55	140.2	125.7	25.37
405	405-BH-01	11.5 - 12.0	Brown gravelly silty sand with gravel (SM)	0.02	5.98	132.8	125.3	25.61
	405-BH-02	21.0 - 21.5	Brown/dk. brown sandy gravel (GM)	0.02	10.95	145.3	130.9	22.29
437	437-BH-01	13.5 - 14.0	Brown fine sandy clay	0.28	26.18	118.5	93.9	44.25
	437-BH-03	14.5 - 15.0	Brown fine sandy clay	0.21	25.69	121.6	96.8	42.53
	437-BH-04	11.5 - 12.0	Brown fine sandy clay	0.20	25.84	121.4	96.5	42.70
	437-BH-05	24.5 - 25.0	Brown fine sandy clay with gravel	0.21	19.34	140.3	117.6	30.18
470	470-BH-01	8.0 - 8.5	Brown silty clay	0.35	18.99	119.5	110.4	40.39
		25.0 - 25.5	Brown silty clay with gravel & carbon nodules	0.07	17.57	135.4	115.2	31.61
490	490-BH-01	7.0 - 7.5	Brown gravelly clayey sand	0.07	11.39	141.2	126.8	24.72
	490-BH-06	23.0 - 23.5	Brown gravelly clayey sand	0.05	11.82	141.4	126.5	24.90
505	505-BH-02	10.0 - 10.5	Dark gray clay	0.28	41.73	112.5	79.4	52.86
		19.0 - 19.5	Light brown clay	0.08	36.72	112.3	82.2	51.2
571	571-BH-06	11.0 - 11.5	Gray brown gravelly sand	NA	6.03	154.8	146.0	13.32

See all notes and definitions on the last page of this table.

Summary of Physical Parameters for Soil Samples

Santa Clara Valley Water District

(units of measurement are as shown)

Site ID	Location	Depth (ft bgs)	Visual Description	Total Organic Carbon (percent)	Moisture Content (percent)	Wet Weight (lbs/cu.ft.)	Dry Unit Weight (lbs/cu.ft.)	Porosity (percent)
586	586-BH-02	23.0 - 23.5	Brown sandy clay	0.08	19.77	124.3	103.8	38.38
	586-BH-04	10.5 - 11.0	Brown sandy clay with gravel	0.14	18.84	120.6	101.5	39.74
	586-BH-06	22.0 - 22.5	Brown gravelly sand	0.05	5.07	111.2	105.9	37.13
592	592-BH-01	26.5 - 27.0	Brown sandy silty clay	0.04	24.44	131.0	105.2	37.54
593	593-BH-02	13.0 - 13.5	Brown silty sand/sandy silt	0.04	14.73	97.6	85.0	49.54
		35.5 - 36.0	Gray brown gravelly sand	0.02	4.86	110.4	105.2	37.54
598	598-BH-03	7.5 - 8.0	Brown clay	0.04	18.27	139.7	118.1	29.89
		11.5 - 12.0	Brown gravelly sand	0.03	7.36	125.5	116.9	30.60

Table proofed by CLC.

Notes:

Specific gravity values were 2.70 for all samples analyzed.
Total organic carbon analyses were performed by Curtis and Tompkins Analytical Laboratories, Berkeley, CA.
All other analyses were performed by URS Greiner Woodward Clyde, Oakland, CA.
ft bgs = feet below ground surface
lbs/cu.ft. = pounds per cubic foot
NA = Not analyzed

APPENDIX 5

STATISTICAL METHODOLOGY FOR EVALUATING MtBE OCCURRENCE ASSOCIATED WITH UST COMPONENTS

Statistical Data Evaluation Methods

A ″linear logistic model″ method of analysis (Selvin 1995) was used to determine the relationship between the presence of MtBE in ground water and the various features or conditions of the UST systems present at the Study sites. The linear logistic model is commonly used in epidemiological and biomedical research to determine if a relationship exists between variables.

For this analysis, the presence or absence of MtBE in ground water was considered a binary dependent variable (i.e., detected or not detected) that could be related to independent variables (e.g., the kind of vapor recovery system, the nature of vent piping, the number of years since the facility was upgraded, etc.). The linear logistic model equated the probabilities associated with the binary dependent variable (presence/absence of MtBE) to the independent variables (UST features/conditions). That is to say, the model is used to produce estimates of the odds that the presence or absence of MtBE was associated with a particular system component or condition. The model produced a logarithm of the odds represented by a linear combination of independent variables, and provided a set of estimated odds ratios as a summary statistic.

Data were evaluated using the Mantel Haenszel procedure (Miller 1981) of a series of 2-by-2 contingency tables to estimate the common odds ratio. In addition, the Fischer Exact test, which employs hypergeometric probabilities, was applied to find the probability of occurrence of the ratios observed from the 2-by-2 contingency table procedure.

As an example, Table 1 shows the correlation between MtBE presence and absence in groundwater relative to vapor recovery system type.

Table 1 MtBE Correlated to Vapor Recovery System Type

MtBE in GW	Vapor Recovery		Total
	Vapor assist.	Balanced	
Detected	8 (f_{11})	5 (f_{12})	13
Not Detected	3 (f_{21})	11 (f_{22})	14
Total	11	17	27

Tables 2 and 3 show the application of the statistical methods to the presence/absence of MtBE (binary dependent variable) relative to type of vapor recovery system (independent variable) to demonstrate how data analysis was accomplished.

Table 2 Common Odds Ratio

Odds Ratios	95% Confidence Interval	
5.87	1.13	29.98

The odds ratio measure of association was estimated using this equation:

$$OR = \frac{f_{11}/f_{21}}{f_{12}/f_{22}}$$

The value of OR ranges from 0 to infinity, with complete statistical independence having an OR value equal to 1.0. An OR greater than 1, as shown in the Table 2, indicates that there is a strong correlation between the independent and dependent variable. The probability of correlation between variables increases as the OR increases. The OR of 5.87 indicates a significant association between the occurrence of MtBE and the type of recovery system, and further, that the odds of an MtBE release to groundwater are 5.87 times higher in an ″assisted″ vapor recovery system, when compared to a ″balanced″ vapor recovery system.

Because the distribution of OR is asymmetric, confidence intervals are typically constructed in terms of log OR. The Fischer P-value was calculated to determine the confidence level of the odds ratio.

Table 3 Fisher′s Exact Test P-Values

1-sided Fisher′s Exact Test	P = 0.0412
2-sided Fisher′s Exact Test	P = 0.0542

The Fischer′s exact P-value of < 0.05 indicates an odds ratio of 5.87 at a confidence level of 95%, confirming the results of the 2-by-2 contingency table procedure. Thus, if additional samples were to be collected, the odds ratio in repeated samples from the same population would be expected to fall between 1.13 and 29.98, 95% of the time.

The Pearson chi-squared correlation coefficient was calculated for data sets with more than two categories (such as tank manufacturer). Higher Pearson chi-squared values suggest a greater tendency towards correlation. As with the previous calculation, P values were calculated to assess statistical significance; $P < 0.05$ was set as the criteria for statistical significance.

Reference

Miller, R.G. 1981. *Survival Analysis*. John Wiley, New York.

Selvin, Steve. 1995. *Practical Biostatistical Methods*. Duxbury Press. Belmont, California. pp. 365-408

APPENDIX 6

FEENSTRA METHODOLOGY

Data Evaluation to Assess for Presence of Residual NAPL

The method of Feenstra *et al*. (1991) was used to assess whether chemical analysis data for soil and groundwater collected during this study indicate the presence of nonaqueous phase liquid (NAPL), or separate phase hydrocarbons. Results of this analysis indicate that, with the exception of one sample from one site, NAPL was probably not present in the samples collected during this investigation. A brief description of the method and a sample calculation is provided in the following sections.

Theory

This section provides a brief description of the theory behind the Feenstra method (Feenstra 1991). The method is based on the concept that laboratory chemical analysis of a soil sample provides a measure of the total mass of the organic chemical of interest in the sample. The mass extracted during chemical analysis of a soil sample includes the mass of the chemical dissolved into the pore water of the sample, the mass sorbed onto solids, and any mass present in the gas phase. The laboratory reports the chemical analysis results as mass of extracted chemical per mass of wet soil (i.e., ug/kg)

The method can be used to calculate an expected concentration of the chemical in pore water from the total concentration provided by the laboratory. This calculated concentration in pore water is then compared to the effective solubility of the target compound. If the calculated concentration in pore water is greater than the effective solubility of the chemical, then the presence of NAPL in the sample is indicated. Conversely, a calculated concentration in pore water less than the effective solubility of the compound indicates that NAPL is not present in the sample. This method is based on the assumption of equilibrium partitioning of the chemical between the solid, pore water, and soil-gas phases.

Equations

The total mass of the chemical in the soil sample can be expressed as:

$$M_t = M_s + M_w + M_a \qquad (1)$$

Where:

M_t = total mass of chemical in the soil sample [M]
M_s = total mass of chemical sorbed onto aquifer solids [M]
M_w = total mass of chemical dissolved into pore water [M]
M_a = total mass of chemical in soil gas [M]

The mass in each phase per unit volume of soil is:

$$M_s = C_s \rho_{b,dry} \qquad (2)$$

$$M_w = C_w \phi_w \qquad (3)$$

$$M_a = C_a \phi_a \qquad (4)$$

$$C_t = {M_t}/{\rho_{b,wet}} \qquad (5)$$

Where:

C_t = total concentration in soil sample (from laboratory analysis) [M/L^3]
C_s = concentration of chemical on sorbed phase [M/L^3]
C_w = concentration of chemical dissolved into water [M/L^3]
C_a = concentration of chemical in soil gas [M/L^3]
ϕ_w = water-filled porosity [dimensionless]
ϕ_a = air filled porosity [dimensionless]
$\rho_{b,\ dry}$ = bulk density of dry soil [M/L^3]
$\rho_{b,\ wet}$ = bulk density of wet soil [M/L^3]

Substituting (1), (2), (3), and (4) into (5) yields:

$$C_t = \frac{C_s \rho_{b,dry} + C_w \phi_w + C_a \phi_a}{\rho_{b,wet}} \qquad (6)$$

Using the assumption of equilibrium partitioning between phases:

$$C_s = K_d C_w \qquad (7)$$

$$C_a = C_w H_c \qquad (8)$$

$$K_d = K_{oc} f_{oc} \qquad (9)$$

Where:

K_d = partition coefficient between soil and water [L^3/M]
H_c = Henry's constant [dimensionless]
K_{oc} = partition coefficient between organic carbon and water [L^3/M]
f_{oc} = mass fraction of organic carbon [dimensionless]

Substituting (7), (8) and (9) into (6) and rearranging to solve for C_w yields:

$$C_w = \frac{C_t \rho_{b,wet}}{K_d \rho_{b,dry} + \phi_w + H_c \phi_a} \qquad (10)$$

C_w is calculated using equation (10), and is compared to the effective solubility (S_e) of the compound, which can be estimated using:

$$S_e = S_t X_m \gamma \qquad (11)$$

Where:

S_e = effective solubility [M/L^3]
S_t = pure-component solubility [M/L^3]
X_m = mole fraction of the target chemical in the chemical mixture (approximated as the mass fraction of the target chemical in the NAPL mixture) [dimensionless]
γ = activity coefficient of the solution (assumed = 1) [dimensionless]

Using a pure-component solubility for MtBE of 48,000 ppm and a volume fraction for MtBE in gasoline of 0.11 (11%) results in a calculated S_e of 5,280 ppm. For benzene, a pure-component solubility of 1,780 ppm and a volumetric fraction of 0.01 (1%) results in a calculated effective solubility of 18 ppm.

Example Calculation

MtBE. The highest concentration of MtBE detected in a soil sample during this study was 15,000 ug/kg (261-BH-01-15-SP), collected from a depth of 15 feet bgs. The following physical parameters were measured in a soil sample collected from a depth of 19 feet from a different soil boring at that site:

f_{oc} = 0.001
$\rho_{b,\ wet}$ = 2.07 kg/L
$\rho_{b,\ dry}$ = 1.68 kg/L
ϕ_w = 0.230
ϕ_t = 0.376
ϕ_a = 0.145 (difference of ϕ_t and ϕ_w)

Where:

ϕ_t = total porosity [dimensionless]

And:

$$\phi_t = \phi_w + \phi_a \qquad (12)$$

Using (12) to estimate air-filled porosity,

ϕ_a = 0.376 - 0.230 = 0.145

The K_{oc} for MtBE was taken as 12.6 L/kg, and the H_c for MtBE was taken as 0.024 (Zogorski et al., 1997).

K_d was calculated using equation (9) as follows:

$$K_d = (12.6)(0.001) = 0.013$$

Using these values in equation (10) yields:

$$
\begin{aligned}
C_w &= \frac{15{,}000 * 2.07}{(0.013 * 1.68) + 0.23 + (0.024 * 0.145)} \\
&= 121{,}138 \;\; ug / L \\
&= 121 \;\; mg / L
\end{aligned}
$$

This result is significantly lower than the calculated effective solubility of 5,500 mg/L. These data indicate that if NAPL is present, residual NAPL does not contain MtBE.

Benzene. The highest concentration of benzene detected in a soil sample during this study was 5,700 ug/kg (594-BH-03-SD), collected from a depth of 45 feet bgs. Physical parameter data were not collected for this site. The following average physical parameters for the study were used for this calculation:

f_{oc} = 0.001
$\rho_{b,\ wet}$ = 2.02 kg/L
$\rho_{b,\ dry}$ = 1.72 kg/L
ϕ_t = 0.1805
ϕ_t = 0.3634
ϕ_a = 0.1829 (difference of ϕ_t and ϕ_t)

The K_{oc} for benzene was taken as 79 L/Kg, and the H_c for MtBE was taken as 0.024 (Zogorski et al., 1997).

K_d was calculated using equation (9) as follows:

$$K_d = (79)(0.001) = 0.079$$

Using these values in equation (10) yields:

$$
\begin{aligned}
C_w &= \frac{5{,}700 * 2.02}{(0.08 * 1.72) + 0.1805 + (0.1829 * 0.22)} \\
&= 32{,}132 \;\; ug / L \\
&= 32.1 \;\; mg / L
\end{aligned}
$$

This result is greater than the calculated effective solubility S_e for benzene of 18 ppm, and indicates the probable presence of residual NAPL containing benzene in the sample. In all of the other soil samples collected during this investigation, benzene was either not detected or detected at much lower concentrations (the next highest concentration of benzene detected in soil was 25 ug/kg). These data support the results of the evaluation using MtBE (above) and indicate that, with one exception, NAPL was not present in the soil and groundwater samples collected and analyzed during the Study. These data suggest that either petroleum fuel released from the UST system was not released in NAPL phase, or if it was released in NAPL phase, NAPL did not migrate to the sampling point.

References

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